Awakening Expectations: exploring social and ethical issues surrounding the medical and non-medical uses of cognition enhancing drugs in the UK

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Abstract

The aim of this thesis is to explore the social and ethical issues surrounding the use of neurotechnologies to control sleep and enhance cognition in British society. Empirically, the project is based on a case study of the wake-promoting drug modafinil. Data analysis involved the study of a corpus of 77 UK news articles and 40 semi-structured interviews with three stakeholder groups: scientists and clinicians, shift workers and students. The analytical framework used was informed by previous work in both medical sociology and bioethics and developed using key concepts drawn from Science and Technology Studies. Conceptualising modafinil as a sociotechnical object, different discourses surrounding sleep, cognitive enhancement and pharmaceutical use were explored to assess how sociotechnical spaces for 'therapy' and 'enhancement' are being constructed and negotiated in different domains of social life.

The analysis of the ways in which modafinil use was positioned and of how various uses were negotiated in both media and stakeholder discourse shows how different groups can conceptualise the same technology in very different ways depending on who is doing the defining, how the users are imagined and the specific context of use. It was apparent that drugs contain not only technological scripts for how and by whom they are to be used, but also strong cultural scripts relating to legitimacy and acceptability of when, where, for what purpose they *should* be used. Importantly, it demonstrates that although norms may overlap to some degree, there is no universal set of norms defining and delimiting how modafinil should be used in contemporary society.

The adoption of an STS perspective, which takes a critical stance towards both technology and users, has shown how the adoption of a therapy-enhancement distinction devoid of context oversimplifies the debate around the use of drugs such as modafinil and does not capture the reality of stakeholder perspectives.

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Contents

Chapter 1: Introduction

Contextual background

Throughout history, people in cultures and communities across the world have experimented with foods, herbs and drugs to alter their minds, bodies and performance (Wolpe, 2002; Flower, 2004). In the UK today, chemical modification of mood, enhancement of sex lives and control over reproduction are well established practices. Traditionally such drugs have been developed for medical conditions and are tightly regulated and controlled. Looking back to even the recent the past, in hospitals, prisons and asylums, it is evident that mental states can be altered technologically to meet social goals in order to protect society from the 'dangerous' individual and to heal the 'sick' (Foucault,1977; 1989; 2001). Over the past century a whole host of mental pathologies have been defined, redefined and various labels gone in and out of fashion.

Contemporary advances in neuroscience and genetics are increasing scientific understanding of the neural basis for cognition. The increasing knowledge of the working of the brain gives rise for the potential to further manipulate cognitive processes through medicinal chemistry. Such advances in neuropharmacology are yielding important treatments for a range of neurological diseases. There are several different compounds both on the market and in development that claim to alter cognitive function. Many of the drugs in development are targeted specifically as therapies for established medical conditions such as Alzheimer's disease, narcolepsy and attention deficit/hyperactivity disorder (ADHD). The current market for cognitive enhancing drugs is large with an estimated 750,000 people suffering from dementia in the UK in 2004. This figure is expected to increase by 2050 to over 34 million people worldwide (Jones, Morris & Nutt, 2005). This factor alone may be enough to mobilise further research and funds into cognitive neuroscience. However, many of these

treatments are also likely to have uses for people without disease or challenge disease categories.

There are many non-prescription drugs and herbal remedies marketed for their cognitive enhancing effects. Gingko Biloba is one of the most popular natural remedies available and has a billion dollar market worldwide (Jones et al, 2005), despite little scientific evidence of its efficacy. Over the past decade, neurotechnologies – technologies which can be used to augment brain function in some way- have dominated the discussions of human enhancement which have orientated around the prospect of improving cognition or, put simply, achieving better brains through technology (Farah, 2002). Pharmaceutical enhancement is just one branch of several technologies that fall under the umbrella of 'enhancement technologies'. These technologies have the potential to be used to improve or modify a variety of human traits and have arisen from advances in different fields of science including genetics, robotics, neuroscience, and ageing research. There are different types of neurotechnology in development including brain-machine interfaces, the implantation of devices and tissue in neurosurgery and psychopharmacology (Farah et al, 2004; Miller & Wilsdon, 2006). Many of the neurotechnologies discussed are presented as theoretical possibilities of the future application of an ever-progressive neuroscientific understanding of the brain. It is in this respect that cognitive enhancement via psychopharmaceutical use stands out from the crowd. It has been argued that while many of the aforementioned neurotechnologies have a hypothetical potential to be used for cognitive enhancement, pharmacological enhancement has already begun (Farah, 2005; Chatterjee, 2004; Kramer, 1993; Hyman, 2006).

Lifestyle drugs now and in the future

According to Kramer (1993), we have already entered into an era where psychotropic drugs are used to treat mild symptoms and improve upon cognitive functioning and emotional states that are well within the range currently seen as normal. There are

several documented cases of drugs that were developed to treat specific diseases that have reportedly crossed over from therapies to common usage for 'enhancement' purposes; recent examples include Beta Blockers, Ritalin and Viagra. Beta-blockers, medication for blood pressure regulation, are reportedly taken by public speakers and actors to hide flushing and other signs of nervousness whilst performing. Ritalin was developed to treat children with ADHD, but reportedly, is now widely used in children who do not qualify medically as ADHD sufferers, and by high school and college students as a study aid. Viagra, the 'erectile dysfunction' drug could almost be considered a household name and is often thought of as one of the first drugs successfully marketed to treat a 'lifestyle' condition. The list of potential targets for therapeutic intervention is extensive, and includes behaviours from compulsive shopping, addictions such as smoking and alcohol to interventions that can make us 'better than well' (White, 2006).

As we look to the future, it is not only science fiction novels and films that portray visions of a society in which the minds and bodies of humans can be altered chemically for various ends. In recent years bioethical debates surrounding the acceptability of cognitive enhancement have been extensive and have caught the imagination of publics and professionals alike; sparking further debate in various arenas outside of academia from popular media[1] to parliament (DTI, 2005; POST, 2007). The off-label use of pharmaceuticals that are popularly perceived as 'lifestyle drugs' such as Ritalin and Viagra has led to speculation that new drugs will find common usage as performance enhancers rather than as treatments for disease. News media, fiction and policy debates perpetuate hopes and fears relating to the manipulation of human cognition at all stages of life. Such stories depict images of a future in which human behaviours can be pharmacologically controlled for ultimate performance and efficiency, from the playground to the sports field and the workplace to the retirement home.

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[1] See appendix V.

New compounds are being manufactured and are in development that, reportedly have the potential to be used to enhance the cognitive abilities of the elderly, the workforce, school children, and anyone else for that matter. Examples of some such compounds are; Ampakines (being developed by Cortex Pharmaceuticals) for the treatment of Alzheimer's disease that could potentially be used as an memory enhancers; CREB- based compounds (being developed by Helicon Therapeutics) for cognitive disorders such as post-traumatic stress disorder that may find uses amongst healthy people to improve or diminish memories; and modafinil (manufactured and sold by the company Cephalon) for the treatment of narcolepsy which has potential for promoting alertness in those without pathology.

A recent report commissioned by the Office of Science and Technology (DTI, 2005) acknowledges the potential development of cognitive enhancement drugs and raises issues for the future. The report predicts that 'by 2025 the ethical debate over whether to use drugs to enhance performance in school children and in the workplace will probably be resolved'. The possibility of the use of such compounds becoming widespread raises many important social and ethical issues that have received much attention within bioethics over recent years. Before going on to discuss the ethical debate in more depth, first it is necessary to explain what is meant by the term cognitive enhancement.

What is cognitive enhancement?

'Enhancement' is a term usually used within bioethics to refer to the use of biomedical tools and techniques to improve the performance, capacities or functioning of 'normal' or 'healthy' individuals (Morrison, 2008). When talking about the enhancement of cognition specifically, several examples are regularly provided which include effects on memory, intelligence, linguistic skill, capacity to focus on intellectual tasks; and sense perception. Usually, cognitive enhancement is separated from mood enhancement and the use of anti-depressants and recreational drugs for this purpose.

However, individuals writing about cognitive enhancement often use slightly different definitions of the term and place different restrictions on the conditions of its use adding a further layer of complexity and confusion to the debate.

For the most part, enhancement is defined as distinct from therapy and some indication is provided of how one should demarcate the two. This division is usually based upon the idea of health, normality or typical functioning. From this perspective, a therapeutic intervention will restore normal or typical functioning with the aim of returning an unhealthy person back to a healthy state whereas an enhancement will improve or extend the abilities or capacities of a healthy individual (who is already functioning normally) outside of this normal or typical range (President's Council on Bioethics, 2002; Tannsjo, 2009; Greely et al, 2008; Hyman, 2006; Farah, 2002).

Others use the term enhancement more broadly, understanding it simply as 'improvement', therefore when used it encompasses therapeutic as well non-therapeutic effects (Conrad & Potter, 2006). In this view, every treatment is considered to be a form of enhancement (Synofzik, 2009) and any distinction between therapy and enhancement is thought of as either arbitrary and difficult to uphold or not analytically disjunctive. For instance, Chan and Harris (2006) claim that the distinction between therapy and enhancement is at best blurred, and at worst non-existent, especially in relation to mental capacities because the range and definition of what is normal is so broad and complex. They argue that this renders 'almost any alteration inexplicable as either therapy or enhancement'.

Problems with demarcating therapy (as the treatment of disease) and enhancement (as the improvement of a normal or healthy state) are regularly acknowledged within the bioethics literature. The concepts of health, disease and levels of normal or typical functioning are difficult to establish (Cahill, 2005) and authors often accept that such definitions are historically situated, being both influenced and derived from contemporary socio-cultural values and norms (Esposito, 2005; Wolpe, 2002).

Examples given commonly to illustrate this point include homosexuality and hysteria, which, once thought of as medical conditions and subject to medical treatments, have since been de-medicalised (Conrad, 2007). Scholars acknowledge that the boundaries between what is considered therapeutic or enhancing have shifted over time and in all likelihood, will continue to shift in the future (Morrison, 2008; Pieters & Snelders, 2009). Many scholars recognise that what medicine chooses to treat at any particular time and place in history is defined as disease, whilst the process of altering what it does not treat is defined as enhancement or abuse (Hyman, 2006; Glannon, 2006). In addition to this, how medicine draws distinctions between disease states and normality is often arbitrary and there are medical treatments for conditions that fall outside of health and disease definitions (abortion is commonly referred to as an example to illustrate this point) (Daniels, 2000).

Some argue that despite this, it is necessary to maintain a therapy-enhancement distinction in ethical debates in order to assess how a persons' quality of life can be improved without threats to health or resource consumption and in order to decide the proper limits to medicine and what should be treated (President's Council on Bioethics, 2002; Tannsjo, 2009; Dees, 2004; Daniels, 2000). Therapy is therefore linked to the goals of the medical institution in healing or curing illness and disabilities where enhancement is thought of as going beyond this remit (Fukayama, 2002; Parens, 1998). In essence, then, enhancement is defined as any improvement or extension of capabilities or performance in the absence of clinically defined illness (Morrison, 2008; Esposito, 2005; Wolpe, 2002; Caplan & Elliot 2004; Farah et al, 2004; Schermer et al. 2009).

The following section provides an overview on the current debate on human enhancement within bioethics and highlights the need for further study in this area. There is a clear need for empirical research into how new technological innovations are framed by different groups and how this can influence how such technologies come to be positioned, accepted and resisted within society. The concept of human

enhancement and the social and ethical issues that it may give rise to will be investigated in this research, through a focus on cognitive enhancement by pharmacological intervention. This area of enhancement has been chosen as according to many commentators, the era of pharmaceutical enhancement may already be upon us. The purpose of this chapter is to introduce the social and cultural climate within which this research takes place, focusing on how cognitive enhancement is constructed within the emerging and heterogeneous field of neuroethics.

Human enhancement and neuroethics

In a paper discussing the history of bioethics Armstrong (2006) describes how bioethics arose from a shift in focus from advice on professional etiquette to the dangers posed by the medical profession on the wellbeing of the patient. Drawing attention to works such as Illich's *Medical Nemesis* (1974) in which dangers or 'threats to health' were said to arise from every aspect of the clinical encounter, Armstrong describes 'the new task of ethics' as being 'to protect the patient from medicine itself' (2006: 874) such as 'side-effects of investigations and treatments, harms of radiation, substance-addicted doctors and dangers of antibiotic-resistant organisms' (2006: 876).

Over the past thirty years, a bioethical enterprise has proliferated and become professionally established as an 'objective' means to arbitrate contentious issues arising from the prospect and development of new biomedical knowledge and technologies (Armstrong, 2006; Pellegrino, 1999; Rose, 2007; Rosenberg, 1999). In the late 1990s and into the early part of the 21st century it was the human genome project and the 'new genetics' which stirred up strong reactions towards the idea of human enhancement (Martin & Ashcroft, 2005). Hopes were raised for the medical applications of new genetic knowledge, for example, gene therapies that would cure all manner of diseases and disorders, whilst fears were voiced over the misuse of new

knowledge and technologies to for example, clone humans or create 'designer babies'. The fears around the human genome project have so far proved to be unfounded. The hopes and promises are a still long way from being realised. However, the promises and perils of new technologies continue to fuel bioethical debates surrounding the idea and acceptability of human enhancement.

The branch of philosophy known as 'neuroethics' is a fairly recent incarnation, dating back only a few years to around the turn of the 21st century. The term neuroethics is used to refer to the specific ethical issues surrounding manipulation of the human brain. The emerging body of neuroethics literature discusses the potential ethical ramifications of a variety of neurotechnologies, both in existence and imaginary, from use of fMRI scans as 'detectors' of abnormal brain functioning (Illes, 2006) to the creation of posthuman 'cyborg citizens' (Gray, 2002).

It is generally accepted in the neuroethics literature, popular media (and at least some sections of the neuroscience community) that, in one respect or another, we do have access to psychopharmaceuticals that can produce cognitive enhancing effects in otherwise healthy persons. Substances commonly discussed include prescription medications that have the potential to be used off-label as enhancements such as modafinil, methyphenidate (Ritalin, Adderall), benzodiazepines, dextramphetamine, Donepezil, Rivastigmine, Galantamine, the CREB enhancer MEM1414 and CREB suppressors (Esposito, 2005). Sometimes non-prescription drugs such as caffeine, nicotine, alcohol and herbal medicines (Ginko) are also included in the repertoire of available cognition-enhancers.

Further to proclaiming the availability of these various substances, the neuroethics literature is saturated with claims that pharmacologically induced cognitive enhancement is *already* being practiced by people of all ages and in several domains of social life, from the classroom to the workplace (Rose, 2007; Farah, 2004; Butcher, 2003; Glannon, 2006; Greely et al. 2008; Hyman, 2006; Chan & Harris, 2006). Amid

claims of the reality and desirability of psychopharmaceutical use to achieve cognitively enhanced mental states is the assumption that the use of cognition enhancers will spread rapidly (Hyman, 2006; Chan & Harris, 2006; Butcher, 2003; Chatterjie, 2006; Wolpe, 2002). This assumption is often stated explicitly and as a matter of fact or agreement. For example, Farah (2002) states that:

> 'enhancement of mood, cognition, and vegetative states in healthy people is now a fact of life, and the only uncertainties concern the speed with which new and more appealing enhancement methods will become more available and attract more users' (2002:1125).

This is echoed by sociologist/ethicist Paul Root Wolpe (quoted in *The Lancet*, Butcher, 2003:132) when he says 'what's coming is the wide availability of powerful, specific cognitive enhancements' adding 'we will enthusiastically embrace these technologies, even as we agonise over whether or not we should do so'.

The assumption that there will be an inevitable increase in the pursuit of cognitive enhancement is deeply embedded in the literature. This 'discourse of inevitability' contributes towards a vision of the future that seems inescapable. The assumption that there will be a high demand across society for psychopharmaceutical enhancement plays an important role in framing the issues arising in ethical discussions, which then focus on notions of free choice, coercion, safety and efficacy. The social and ethical issues raised will be returned to and discussed further in the next section.

A literature search in early 2010 found over 300 articles published in the bioethics literature since 2002 specifically discussing the issues surrounding cognitive enhancement using pharmaceuticals[2]. A range of different ethical perspectives surrounding the potential implications of chemical performance enhancement are

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[2] 30 of these papers were chosen at random for a closer reading and the analysis presented below is based upon this sub-set of papers (see appendices for a list of papers).

present in these debates. Whilst some argue that as a species, human beings have 'a clear moral duty to enhance' (Harris, 2007) others debate whether pharmacological enhancement should be seen as a legitimate lifestyle choice or as a misuse of prescription drugs (Racine & Forlini, 2010).

Prospective uses for and users of cognitive enhancers

Despite acknowledging some of the problems with doing so, the uses of cognition enhancing drugs are typically framed through a therapy- enhancement dichotomy in the neuroethics literature. It is claimed that cognition enhancing 'products are gain[ing] cultural acceptance' (Maher, 2008) and several different types of actual or future user are depicted; some of these are outlined below. How each domain might possess specific obligations, responsibilities, purposes for and objections towards enhancement is sometimes recognised by scholars who argue that a context specific approach to disentangle the complex social and ethical issues is both desirable and necessary (Synofzik, 2009; Schermer et al, 2009). This section outlines some of the purported uses for and users of cognition enhancing drugs and the social and ethical issues that have been raised in each case.

Therapeutic uses

Neurological and psychiatric patients are often referred to as being 'in need' of cognition enhancing drugs (Clausen, 2009; Maher, 2008; Nature, 2007; Sahakian & Morein- Zamir, 2007). Patients as users of cognition enhancing drugs are depicted as those with clinically defined illness who will derive some sort of therapeutic benefit from drug consumption. However, the increased tolerability of medications, increased public awareness of mental illness and the aggressive marketing of medications by pharmaceutical companies has been linked to 'the widespread use of psychopharmacology by people who would not have been considered ill twenty years ago' (Farah, 2005; 36). Since the first edition of the DSM in 1952, in excess of 400

categories of new mental illnesses have been conceived. It is argued that in labelling formerly normal states as disorders or diseases they become legitimate goals of pharmacotherapy (Schermer et al, 2009; Pieters & Snelders, 2009). Concerns are regularly raised in the literature over further medicalisation and pathologisation of human behaviours currently thought of as within the normal range (Farah et al, 2004). It is sometimes argued that medicalisation leads social factors to be downplayed as medicines come to be seen as the only solution for complex problems (Schermer et al, 2009).

Whether one is talking about therapy or enhancement in these cases is not always clear (Schermer et al, 2009) and it is also not clear the extent to which psychopharmaceuticals are prescribed off-label for so-called enhancement purposes. Wolpe (2002) argues that 'clearly some of the top selling drugs in the world are being used by patients that fit no traditional definition of pathology, but still see their own functioning in terms of a deficit that these drugs address'. Whether further medicalisation of mental states should be thought of in positive or negative terms is questioned and debated.

Surprisingly perhaps, therapeutic uses for already established clinical disorders are rarely problematised in this body of literature (Cahill, 2005; Farah et al, 2004). When concerns are raised, they tend to address issues of safety and efficacy. It has been argued that benefits should be weighed against short-term and long-term side-effects of the specific medication in question and these should be discussed between patient and doctor (Sahakian & Morein- Zamir, 2007).The proper role of medical professionals in the prescription of enhancement drugs is frequently raised as an issue that needs more discussion. Whereas some argue for a type of enhancement medicine where doctors become more like 'quality of life consultants' (Chatterjie, 2004), others argue that the prescription of enhancing drugs by medical professionals to those without illness would not be appropriate as this would not entail a therapeutic relationship (Glannon, 2008).

There is also some debate over the philosophical concepts of authenticity and identity, and whether these concepts are threatened through the use of psychopharmacology (Elliott, 1999). Some studies and commentators argue that psychopharmacological agents help a person's real identity' to emerge (Kramer, 1993), others argue that concerns over authenticity are unfounded (Glannon, 2008). Bolt and Schermer (2009) report on interviews with adult ADHD users of medication to investigate concepts of identity and authenticity, concluding that individual views may vary depending upon different views of the self, personal identity and authenticity that one adopts.

Between therapy and enhancement

The use of cognition enhancers by some groups of people, such as shift workers, persons in the military and those within the criminal justice system, falls into a grey area between the two extremes of treatment and enhancement.

Convicts

As more of human functioning is being explained through the brain and its processes, more behaviours are understood as having a physical basis. Although not a central tenant of the neuroethics discourse, criminal behaviour is occasionally mentioned as something which could, in the future, come to be understood as a result of neural pathology (Glannon, 2006) and the prospect of 'neuro-correction' (Farah et al, 2004; Farah, 2005) is raised. This could potentially involve court-ordered intervention using pharmaceuticals or other types of neurotechnology with the goal of treating the convict in order to augment socially undesirable behaviour (Farah, 2002). Whether this type of use would be classed as therapy or enhancement is not clear. There are obviously different types of criminals and unlawful behaviours dependent upon social and cultural assumptions, conventions and expectations about how people ought to behave. In addition, the concepts of 'free will' and 'responsibility' for one's behaviour

are essentially normative, making the use of cognition enhancers in this context a grey area (Glannon, 2006).

Military personnel

The use of cognition enhancing drugs by the military is typically presented as an established working practice (Greely et al, 2008; Glannon, 2006; Farah, 2005; Farah, 2002; Wolpe, 2002). Military personnel are depicted as being sleep deprived and fatigued, operating in dangerous situations where they are under constant threat of serious harm, being killed, at risk of failing their mission, or causing the death of friendly soldiers. There is some debate as to whether military use of cognition enhancers should be considered medical or non-medical. For instance, Gebhardt (2004) discusses a story in a Dutch newspaper that reports on the trial of two marines who had been found asleep whilst on guard duty in Iraq. The debate focused on whether modafinil use should be allowed to suppress the need for sleep in military situations. In the Dutch case, evidently, objections were based upon concerns over the safety of off-label use of this medicine, referring to modafinil use in this context as 'preventative medicine' (Gebhardt, 2004; 268). The dilemma often raised in the military context is how available technology should be used to best effect in order to 'protect combatants' in the case of emergency without exposing them to any unnecessary risks to health.

In one sense, the use of cognition enhancing drugs is positioned as a type of therapy to repair degraded cognitive functioning rather than as an enhancing agent that would lead to the creation of a new breed of post-human super soldiers. In another, drugs are referred to alongside other 'life support equipment' and thought of as 'another component of the warfighter arsenal' (Russo, 2007:120). Often situations are imagined where the use of cognition enhancing drugs seems the sensible action to take and it is argued that they could reasonably become the recommended course of action (Sahakian & Morein- Zamir, 2007; Russo, 2007). It has been argued that the use of

enhancement drugs would be ethical if taken in a context where it may save a soldier's life or contribute towards the success of the mission. Using this line of reasoning, the *non-provision* of an emergency supply of alertness-enhancing drugs, such as caffeine, to military persons in combat scenarios would warrant ethical consideration (Russo, 2007).

When the use of cognition enhancing drugs is considered to be non-medical, concerns are raised that military personnel might be coerced into taking substances to alter their brain functioning, which could turn out to have harmful effects or be abused (Farah, 2005; Russo, 2007). Overall, it is not clear whether ethicists believe that cognitive enhancement by military personnel should be endorsed. Although acknowledged to be controversial, it is however, often presented in a favourable light.

Shift workers

Likewise, some articles mention the treatment of shift workers suffering from a new clinically defined disorder, Shift Work Sleep Disorder (SWSD), with the drug modafinil, and accept this as a legitimate therapeutic use of the drug (Greely et al, 2008; Glannon, 2006). Despite this acceptance, in a minority of papers the concern is raised that in prescribing modafinil for SWSD doctors could be seen as being complicit in adapting workers to the demands of their employers and society (Schermer et al, 2009).

The non-medical use of the same substance by those who are considered to be normal and healthy but sleep deprived and tired is also raised as a possibility (Sahakian & Morein- Zamir, 2007). Western societies are commonly referred to as over-worked and chronically sleep deprived (Cahill, 2005). Interestingly, several specific occupational roles are repeatedly referred to by bioethicists discussing the potential benefits of a cognitively enhanced workforce. Typically, these include the drowsy doctor or surgeon on night call; airline pilots on transcontinental flights; air-

traffic controllers who have to operate in a high stress environment; long-distance lorry drivers who drive through the night; nurses working long shifts; and ambitious professionals trying to pack more work into a day (e.g. Greely et al, 2008; Sahakian & Morein- Zamir, 2007; Glannon, 2008; Synofzik, 2009; Wolpe, 2002; Farah, 2002).

Commentators write that cognition enhancing drugs are often already prescribed off-label for persons working in these professions (Greely et al, 2008). For some, the benefits of this practice are clear- through the further use of cognition enhancing drugs, society could have safer flights, safer medical encounters and safer roads (Esposito, 2005; Wolpe; 2002; Farah, 2005; Sahakian & Morein- Zamir, 2007). The benefits of cognition enhancing drugs are described as helping shift workers to 'better focus, plan and remember' (Sahakian & Morein- Zamir, 2007) and stay awake on the drive home from work, thus reducing the incidence of road traffic accidents (Farah et al, 2004). The use of such substances is linked to an expected increase in workplace efficiency and productivity and so cognitive enhancement is thought to be in the interests of employers as well as employees.

Often, the use of cognition enhancing drugs as a way to boost mental energy, alertness or performance is compared to the consumption of caffeine for the same purpose. This discursive strategy acts to frame the practice of cognitive enhancement as something which is already being practiced with little objection. Time and time again, the reader is asked questions such as 'who considers a double shot of espresso or a caffeine drink an unfair advantage at work?' (Synofzik, 2009) and it is assumed that cognition enhancing drugs with 'small or no side effects but with moderate enhancing effects that alleviate forgetfulness or enable one to focus better on the task at hand during a tiring day at work would be unlikely to meet much objection' (Sahakian & Morein- Zamir, 2007; 1158).

Others question whether the consumption of pharmaceuticals in order to boost workplace performance or maintain high levels of cognitive functioning is ethically

sound. Throughout the neuroethics discourse we are presented with an image of society that is skill driven and knowledge-based where one's success correlates with their cognitive abilities (Rose, 2002; Esposito, 2005, Glannon, 2008). Enhanced cognitive capacities are thought of as a competitive good that can give some people an advantage over others in gaining employment, advancing careers and earning a higher income (Tannsjo, 2009; Butcher, 2003). To be 'smarter' than other people is considered to be an asset in many situations and it is assumed that those who are not enhanced could be disadvantaged. Fears are voiced that if usage grows in the workplace, employees could feel compelled to take cognition enhancing drugs in order to remain competitive or simply to just keep up (Cahill, 2005; Glannon, 2008). The ethical issues raised therefore include concerns over unequal access, cost barriers, coercion or pressure to enhance and the potential for substance abuse (Greely et al, 2008; Hyman, 2006; Wolpe, 2002). Policy mechanisms are frequently suggested as a way to protect against these scenarios.

Enhancement uses

Commentators claim that ADHD medications, such as Ritalin and Adderall and the narcolepsy medication modafinil, are the drugs most commonly used by 'healthy, normal people' in order to gain more time, improve their cognitive abilities and boost their performance and productivity (Farah, 2002; Greely et al, 2008; Glannon, 2006; Butcher, 2003; Hyman, 2006). For instance, Cahill (2005:2) writes: 'the key to limitless productivity, energy, focus and just plain feeling good every single day can now be found in 100-200mg capsules of modafinil'. Often utopian scenarios are imagined by ethicists to depict how individuals and society could benefit from cognitive enhancement. For example, Chan and Harris (2006) imagine a world in which:

> '…intellectual performance is routinely boosted by pharmacological or computer-based technologies, assisting people to greater fulfilment of their potential in all areas of life' (Chan & Harris, 2006: 365).

The concerns raised in this context of use frequently focus on safety and efficacy of drug consumption in those without illness (Williams & Martin, 2009; Chatterjie, 2009; Oliveria, 2009; Schermer et al, 2009). It is also feared that users could suffer from lifestyle addiction, as it is assumed that after having experienced the 'power of artificially augmented mental faculties, who would voluntarily give up such capabilities?' (Chan & Harris, 2006; 363). Again, concerns over authenticity, agency and identity emerge; views are often polarised as to whether the use of drugs changes or undermines who a person is and their responsibility for their actions (Hyman, 2006; Glannon, 2006).

Despite such fears and concerns, there are calls from prominent ethicists and those within the neuroscience community for the presumption that 'mentally competent adults should be able to engage in cognitive enhancement using drugs' (Greely et al, 2008; 703; Harris, 2007b; Harris, 2009; Bostrom, 2007). Throughout the neuroethics discourse is the expectation that if healthy individuals and society can be protected against the risks of enhancement through appropriate legislative acts- those risks being harms to health, coercion and abuse- the benefits for society will be raised levels of attainment and productivity, health and overall wellbeing. As mentioned above, these expectations feed into a rather utopian vision of the future such as that imagined by Greely et al (2008) who say:

> '…in a world in which human workspans and lifespans are increasing, cognitive
> enhancement tools- including the pharmacological- will be increasingly useful
> for improved quality of life and extended work productivity, as well as to stave
> off normal and pathological age-related cognitive declines. Safe and effective
> cognitive enhancers will benefit both the individual and society'.

Ethicists do acknowledge that the drugs available today may have limited efficacy or unknown side-effects (see: Rose, 1993; Chan & Harris, 2006; Hyman, 2006; Wolpe,

2002) and occasionally, someone will question whether these drugs are actually efficacious enough to be called 'enhancements'. However, ethical discussions tend to be based on the assumption that efficacious drugs free of unwanted side effects *will* become available. Therefore, questions around safety and efficacy are made to appear somewhat superfluous in the face of frequent claims that new, safer and more effective enhancement drugs are 'coming soon' allowing such issues to be dismissed as pragmatic rather than ethical concerns.

Although it is often claimed that enhancement drugs will appeal to all healthy people, three specific groups stand out in the literature. Healthy people are usually exemplified through the image of older people, academics and students.

Older people

Current research into finding better treatments for dementia is often cited, and assumptions are made that at least some of these products will have applications as enhancements for normal memory in those who are middle and old aged (Farah, 2005; Glannon, 2006). It is claimed that there will be a broad appeal and high demand for cognitive enhancing drugs amongst older people experiencing normal age-related cognitive decline (Greely et al, 2008; Farah, 2002). It is assumed this group will be most interested in memory enhancement (Farah et al, 2004). In this domain, concerns are raised over the unknown consequences or potential 'hidden costs' of enhancement (Glannon, 2006).

Academics

Some articles refer to cognition enhancing drugs as 'professors' little helpers' (Sahakian & Morein- Zamir, 2007) and it is claimed that there is already a significant amount of drug taking among academics with the goal of improving cognitive performance or stamina (Maher, 2008). Somewhat controversially, academics are

depicted as using these drugs to increase their abilities to become 'more than equal' (Nature, 2009). Apparently, Professor Michel Jouvet, director of the French laboratory that developed modafinil remarked that he took the drug to increase his own productivity (Dorozynski, 1989; quoted in Cahill, 2005). A paper by Sahakian & Morein- Zamir (2007; 1159) cites data from an anonymous questionnaire in which a 'UK professor' explains how s/he obtained modafinil on the Internet and uses it 'fortnightly to enhance productivity and for important intellectual challenges'. The effects of the drug are described as 'mild but very valuable' in 'increasing mental energy' and improving 'sustained hard thinking'. Bostrom (2007) argues that 'anything that can help our brains deal better with the complex challenges of the 21st century is not only to be welcomed but actively sought' (Nature, 2007; 520).

Students

University students are depicted as both existing and imagined future users of cognition enhancing drugs for distinctly non-medical purposes, to enable them to study longer, perform all-night study sessions, boost alertness in lectures, and improve exam grades (Nature, 2009). Much of this literature originates in the USA and is based around the use of Ritalin (methylphenidate) by students as a means to increase concentration, alertness and improve academic performance[3]. Claims are frequently made that an ever-increasing percentage of students are obtaining neuropharmaceuticals either illegally or by false diagnosis and using these substances to improve their academic performance (Sahakian & Morein- Zamir, 2007; Volkow & Swanson, 2007; Chan & Harris, 2006; Greely et al, 2008; Cahill, 2005; Butcher, 2003; Farah et al, 2004; Farah, 2002; Schermer et al, 2009; Forlini & Racine, 2009).

This practice is constructed as a significant social problem on one hand, and as 'old news', a routine practice which has always and will always go on, on another. However, it is rarely recognized in the literature that despite a certain percentage of

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[3] For example, in one study Teter et al, (2006) found that 8.3% of college students admitted to the illicit use of prescription stimulants in their lifetime, in other studies the percentages cited vary.

students reportedly taking cognition enhancing drugs, the remaining body of students have (presumably) chosen not to take this route- assuming of course that neuropharmaceuticals are as widely available on college campuses as this literature would have us believe. Whilst a few commentators maintain that cognition enhancing drugs should be available to students without prescription, arguing that the benefits of such drugs outweigh the risks they pose, (e.g. John Harris, quoted in *THES*, 2009; 10), others raise concerns over the use of such substances in competitive situations for example, during examinations (Sahakian & Morein-Zamir, 2007) where even small improvements in performance could translate into substantial benefits. Ethical questions are then raised in relation to autonomy and freedom to choose versus pressure to enhance (Farah, 2004; Esposito, 2005; Forlini and Racine, 2009) and notions of fair play and equality.

Others fear that such substances could be abused, lead to addiction or dependency in vulnerable people or put users at risk of adverse medical consequences (Volkow & Swanson, 2007) and argue that cognition enhancing drugs should not be freely available to the student population. The use of drugs by students in 'elite universities' is commonly framed as a negative practice that should not be encouraged (Synofzik, 2009; Sahakian & Morein- Zamir, 2007). However, this is also a grey area, as some substances are compared to caffeine and thought to be just the next step in an already acceptable and established practice of cognition enhancement. In an interesting study, Forlini and Racine (2009) interviewed students, parents and healthcare providers about their perspectives on cognition enhancement using neuropharmaceuticals. They found that despite valuing the same ethical principles (of autonomy and liberty) at a normative level, attitudes towards cognitive enhancement did vary significantly between groups being shaped by the social context of the individual and their personal values.

Abuse

In discussions of the use of cognition enhancers by healthy children and sportspersons, the use of these substances are positioned as illegitimate. In these contexts the use of psychopharmaceutical drugs is usually referred to as abuse of medicine rather than therapy or enhancement and it is typically argued that cognition enhancing drugs should not be used.

Children

Usually, discussions about cognitive enhancement in children focus on the prevalence of ADHD and the use [or as it is often claimed, the overuse] of drugs such as Ritalin to alter socially undesirable behaviour (Conrad, 2007; Singh, 2003). Children are treated as a special case, because they are thought of as not capable of making their own informed choices (Greely et al; 2008). Over-zealous parents are imagined as feeding their children medication in order to boost their capabilities in the classroom (Hyman, 2006; Farah, 2002). Farah (2002) writes that 'according to some experts, pharmacological enhancement of children's attention is routine in some communities' (2002; 1124). Some suspect that this process is also being encouraged by teachers seeking 'more orderly classrooms' (Greely et al, 2008). Attention is then focused on the consequences of using medical technologies to deal with social problems with questions raised over the use of medicine to transform, alter and enhance bodies rather than ameliorate suffering. Apparently, US courts have already heard cases where parents were coerced into medicating their children by schools for attentional dysfunction (O'Leary, 1998, cited in Farah, 2005). Fears are raised that the use of neurotechnologies could narrow the range of acceptable human behaviours by shifting the line separating the normal, desirable and healthy from the deviant, pathological and sick.

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The discourse is often quite socially deterministic as assumptions are made that the use of cognition enhancers by children would be of benefit to them academically speaking and also to their teachers by improving behavioural standards. For instance, Farah et al (2004; 423) claims that 'teachers will find enhanced pupils more receptive to learning' and Greely et al (2008; 704) write that liberal use of cognition enhancers 'would be expected to encourage classroom order and raise standardised measures of student achievement, both of which are in the interests of schools'. However, just because a child is chemically 'enhanced' does not mean that they will be automatically interested in school work. This line of argument implies that children who do not behave in school have something wrong with their brains rather than considering that they might be bored, have ulterior motives for their behaviour or choose not to pay attention. For example, how would a substance that enhances attention make a child more 'receptive to learning' in a history class when they are more interested in celebrities, fashion and music than immigration patterns during World War II? One cannot assume that the child will use their enhanced mental capacities for the benefit of their school work.

The consensus seems to be that children should not be allowed access to cognition enhancing pharmaceuticals not only because they are thought not able to make their own informed choices but also for fear of adverse health risks, increased pressure to perform and coercion to enhance (Hyman, 2006; Wolpe, 2002).

Athletes

Athletes are mentioned as one group who could potentially abuse new and emerging cognition enhancing drugs. The use of such substances in a competitive sporting situation is only very occasionally explored and questioned by ethicists (Wolpe, 2002; Nature, 2007). For instance, an editorial piece in Nature (2007) raises the possibility that in the future, the rules on pharmacological enhancement in sports could be changed. It states that 'by the end of this century, the unenhanced body or mind may

well be vanishingly rare' and thus argues that 'as pharmacological enhancement becomes everyday, views of bodily enhancement may evolve sufficiently for sporting rules to change on that too'(2007; 512). However, in general the consensus seems to be that cognitive performance enhancement in a sporting context should be seen much the same as other types of physical performance enhancement. In sports, accomplishments are usually valued for the natural talent, luck or effort of an individual (Synofzik, 2009). Any type of chemical performance enhancement in sports would give competitors an unfair or unnatural advantage over others so be considered cheating because it is against the rules (Greely et al, 2008).

Social science meets neuroethics

As a branch of moral philosophy, neuroethics could be considered as aiming to draw on relevant facts and articulate relevant ethical principles in order to evaluate ethical concerns raised in relation to new neurotechnologies by means of rational argument (Farah et al., 2004). The philosophical thesis that there is a logical distinction between facts and values, or what 'is' and what 'ought' to be, can be traced back to Hume's (1739) *Treatise* (Miller & Wendler, 2006). This thesis argues facts and values are fundamentally and functionally different. Facts are understood as descriptive and objective, whereas values are seen as subjective and evaluative and used to express emotions, attitudes, advice and so on. Descriptive and empirical data may be drawn upon in the philosophical reasoning of a situation, however, such evidence alone cannot be used to properly solve a normative problem. There are various views on the value of upholding a fact-value distinction within bioethics and a range of perspectives and positions have been adopted (see: Alveraz, 2001; Callahan, 1999; Herrera, 2008; Lopez, 2004; Solomon, 2005). Without delving too far into the long-running philosophical debate about the difference between facts and values, whether a distinction between the two should be upheld and the value of empirical research in ethical debates, this section briefly outlines the position adopted in this study.

Recent social research has demonstrated how social contexts can shape the way bioethical problems and their solutions are imagined (Busby, 2006; Hedgecoe, 2001; Wainwright, et al, 2006). For example, in their paper discussing the bioethics of infectious diseases, Tausig et al. (2006) explain that if bioethicists took sociological theories into account regarding disease causation as opposed to reliance on the biomedical model of disease different ethical considerations would come into focus. In a cross-cultural study investigating the role of bioethics in the development of biobanks, Salter and Jones (2005) found that central ethical principles were interpreted differently depending on the cultural context. Forlini and Racine (2009) argue that the broader social context is important for understanding how and why perspectives about cognitive enhancement diverge. In a study investigating perceptions towards the use of methyphenidate by students, they found that despite holding liberal individualistic values and viewing autonomy as a guiding ethical principle, attitudes towards enhancement varied significantly between groups depending on their specific social context. They conclude that it is unclear whether the issue of choice to enhance can be discussed outside of specific social contexts.

 In another example, a study researching the ethical issues surrounding assisted conception, (Edwards, cited in Haimes, 2007) found that informants located ethical complexities raised by assisted conception within complex family relationships. If the existing scenario posed no concern, then parallels drawn with assisted contraception were also accepted and vice versa. They argue that new problems are understood and contextualised through existing cultural reference points which can act to resolve ethical dilemmas. However, the same ethical issues can be located within different contexts by different actors and have different implications and meanings. Haimes (2002) argues that it is these differences that are open to empirical investigation and that empirical study can stimulate further questions about the ethical context of the technology.

As many those within the field of neuroethics also acknowledge, the very facts that count as 'relevant' in ethical debates are themselves socially, historically, culturally (and politically) constituted and situated (Turner, 2009). It has been argued that there is a tendency within bioethical debates to transform problems into representations of problems that make them easier to solve (European Commission, 2006). Consequently, the complex dynamic and structured nature of social and institutional challenges which such scenarios entail, remain hidden (Manson, 2006). Critics of the field suggest that the ethical debate so far has been dominated by review articles seeking to summarise current neuroscientific debates and suggest ways in which ethical analyses of their content and implications might prove useful (Martin & Ashcroft, 2005). These debates focus on expectations of future drugs or on extreme cases rather than presenting a realistic discussion of those presently available. For instance, Schermer et al. (2009) argue that a significant part of this debate suffers from inflated expectations and technology hype. They conclude that further discussion of the advantages and limitations of enhancers is needed on a collective social level.

Therefore, social scientific studies of ethically contentious issues have revealed that there can be multiple perspectives on ethical issues and have demonstrated that ethical principles can also be of an ambivalent nature (Bauman 1993; Haimes, 2002; Lopez, 2004). Social research can reveal how ethical dilemmas present themselves, are understood and played out in social context and how the same action can be interpreted differently depending upon its social location (De Vries et al, 2007; Haimes, 2002; Hedgecoe, 2001; Racine, 2008). Therefore, empirical social science research can engage with bioethical debates through the study of contextualised scenarios to illustrate how bioethical problems are both generated, framed and shaped by different cultural frameworks, structures and institutions (Conrad, 2001; De Vries et al, 2007; Haimes, 2002; Hoffmaster, 2001; Locke, 2001; Rosenberg, 1999; Salter & Jones, 2005). The empirical study of detailed and contextualised cases can identify discourses outside of bioethical accounts and illustrate the agency of different actors in constructing, choosing and shaping alternative futures. The position adopted

in this research follows that outlined by Haimes (2002) in that social science research can usefully contribute to, engaging with rather than simply informing, the ethical debate surrounding cognitive enhancement.

Rationale for this research

To summarise, the neuroethical discourse around psychopharmaceutical enhancement is based upon the claim that cognitive enhancement of the healthy *is already happening*, despite limited empirical evidence available. The discourse generates several expectations: that the use of psychopharmaceuticals will spread to more people; this widespread usage will change the way we live our modern lives; and that the future will bring new ways of enhancing, controlling and reading the brain. In framing cognitive enhancement in this way it appears that an increase in the pursuit of human enhancement is inevitable.

Whilst therapeutic uses are generally accepted on the ground of patient benefits, enhancement uses are debated. There are also some cases in which the consensus seems to be that the use of cognition enhancing drugs would be abuse as opposed to therapy or enhancement and, in these cases, commentators argue that cognition enhancing drugs should not be used. Overall, issues conceptualised as warranting ethical deliberation in the neuroethics literature can be divided into two main categories; those that concern practical and regulatory matters of enhancement such as safety, efficacy and access to neurotechnologies with enhancement potential; and those of a philosophical nature, concerning for example, possible threats to the concepts of authenticity, identity and human nature (Illes, 2006; Parens, 2006). There is also a third type of debate that could be broadly termed social, which includes issues of medicalisation, understandings of health, illness, therapy and enhancement and socio-cultural change.

The ways in which uses of these drugs and their users are imagined and framed in neuroethical debates therefore influences which social and ethical issues are given priority and which are not. The key point to take from the snap-shot of neuroethics presented here is that in framing the enhancement debate in this way, ethicists are actively involved in the construction of particular neurofutures. The way bioethicists position themselves as ethical experts able to sift through the issues and concerns raised by new technologies using rational thinking and informed reasoning in order to provide value-free evaluations of how, when and if enhancement technologies should be used and by whom is therefore problematic.

However, few studies have taken a social science standpoint or investigated use of neuropharmaceuticals from the perspective of various stakeholders. Instead, as I have attempted to show in the above analysis, arguments tend to depend on extreme or typified cases which act to construct a particular kind of ethical problem and resolution (Elliott, 1999; Singh, 2005). As such it is difficult to ascertain from these ethical debates how cognitive enhancement technologies are (or will be) used and how their use will be understood, positioned and negotiated by prospective users in the context of their everyday lives.

<u>Modafinil as a case study</u>

As cognitive enhancement is a relatively broad topic it was necessary to choose a case study to provide a focus for investigation. Modafinil belongs to the class of cognition enhancers known as 'wakefulness agents'. It is a 'eurogic' drug that promotes arousal, or 'calm wakefulness' (Cephalon, 2008) enabling the user to be awake for days at a time. The exact mechanism of action it uses to promote a state of wakefulness is still under investigation (Cephalon, 2008). Modafinil has been marketed under the trade name Provigil in the UK by US company Cephalon for the treatment of the rare sleep disorder narcolepsy since 1998 and excessive day- time sleepiness (EDS) associated with obstructive sleep apnoea/ hypopnoea syndrome

since 2002. Since its emergence in 1998 as a treatment for narcolepsy, various states of somnolence have been redefined in (bio)medical terms and subjected to pharmacological and/or psychiatric treatment. Modafinil's license has been extended to cover excessive daytime sleepiness (EDS) associated with a wide range of conditions including chronic fatigue syndrome, cancer, and other sleep disorders such as restless legs syndrome (RLS). In 2004 the license was extended to include the treatment of the disruption in circadian rhythms resulting from shift work, in both the US and the UK.

The effects of modafinil reportedly include a variety of other cognitive benefits, such as improving alertness, concentration, and memory (Turner et al., 2003). In a recent study the cognition enhancing effects of modafinil were investigated using healthy subjects. Modafinil was found to significantly enhance performance on a variety of neuropsychological tests including those testing visual memory, spatial planning and reaction time. In addition to this, subjects reported feeling more alert, attentive and energetic whilst on the drug. It was not found to have any significant side effects or addictive qualities (Turner et al, 2003). There have been reports of other studies with similar findings of increased alertness and wakefulness whilst testing the drug on pilots (Walz, 2003).

It is argued that modafinil is a drug that that could potentially be taken by the general population to promote alert wakefulness and reduce the need for sleep. It has captured public and professional imagination alike and been the subject of radical articles in both the scientific and popular press. Modafinil has also been one of the focal points of the bioethical discussion on human cognitive enhancement. Over recent years this drug has featured in numerous newspaper stories, scientific studies, bioethics articles, and even been given the starring role in television documentaries, radio talk shows and news bulletins (BBC Television, 2009a; 2009b; BBC Radio 4, 2007; Channel 4 news, 2009; 2008).

Although often referred to as a 'safe' drug in the neuroethics literature and media discourse, modafinil does come with some serious health warnings. The company that manufactures the drug warns that users could develop a 'serious or life threatening rash, including Steven-Johnsons Syndrome (a rare life threatening condition which affects the skin and causes cell death)', that this has been reported in both children and adults and that the drug is not approved for use in children for any indication. On the patient information leaflet provided with the drug, patients are reminded that PROVIGIL (modafinil) is a:

'…controlled substance because it can be abused or lead to dependence. Keep PROVIGIL in a safe place to prevent misuse and abuse. Selling or giving away PROVIGIL may harm others, and is against the law.' (Cephalon, 2008: 4).

Common side effects reportedly include headache, nausea, rhinitis, diarrhea, back pain, insomnia, dizziness, and dyspepsia. Although less frequently reported, use of the drug has also been linked to psychiatric symptoms including suicidal ideation, psychosis, mania, delusions, hallucinations, aggression, anxiety, nervousness, depression, agitation and confusion (Cephalon, 2008). The company also reports that modafinil has reinforcing properties, as evidenced by its self-administration in monkeys previously trained to self-administer cocaine (Cephalon, 2008).

The idea that the use of neurotechnologies, such as modafinil, to manipulate brain function can be understood within multiple frameworks that provoke varied cultural commentary and normative reaction provides the starting point for this research. Because of its multitude of uses and wide range of prospective users, modafinil can be used as a good case study to investigate the reception and uptake of these new technologies within popular culture, the role and function of medicine in attempts to control sleep, once considered a private corporeal form of existence, and the normative implications this might have.

Research Aims

The overall aim of this study is to explore the social and ethical issues relevant to the pharmaceutical augmentation of human cognitive functioning, in order to determine how sociotechnical spaces for 'therapy' and 'enhancement' are being constructed and negotiated in different domains of social life. The core research question this project aims to address is: How is the use of the drug modafinil to augment human cognition understood within the mass media, by researchers and potential users, and what implications does this have for debates about enhancement technologies?

The overall aim of the study can be broken down into four sub-aims:

1. To establish the ways in which modafinil is represented in the mass media and how this impacts upon views of the legitimacy of its use across different contexts.
2. To describe how the use and users of the technology are framed within medical and scientific discourse.
3. To analyse the ways in which prospective users of modafinil understand, position and negotiate use of the drug in the context of their everyday lives.
4. To explore the implications of these empirical findings for normative debates about the idea of cognitive enhancement and social science debates about (bio)medicalisation.

Framework for thesis

Running parallel to bioethical debates, in the sociological literature the prospect of human enhancement is discussed in relation to therapy where one finds extensive critical commentary and analysis surrounding the 'medicalisation' and 'pharmaceuticalisation' of numerous bodily and psychological states that were once thought of as within the 'normal' range of human behaviours, but have now come under the purview of medicine (Williams et al, 2008a; Williams et al, 2008b; Williams,

Gabe & Davis, 2008; Conrad, 2007; Scott, 2006; Singh, 2003). How the prospect of human cognitive enhancement relates to contemporary social theory on medicine, society and the body will be discussed in chapter 2.

Informed by previous work in both medical sociology and bioethics, the debate around medical/ non-medical or therapy/enhancement uses of this drug will be approached from an Science and Technology Studies (STS) perspective. Conceptualising modafinil as a sociotechnical object, the analytical framework will focus on the interaction between the technology and prospective users (Woolgar, 1991; Akrich, 1992) to understand how pharmaceuticals with both therapeutic and enhancement potential are understood, positioned and negotiated in social context. Data collection and analysis are discussed in chapter 3.

The mass media have been shown to provide a central forum for debates regarding issues relating to science, society, lifestyle, and most importantly, health and illness (Nerlich, Johnson & Clarke, 2003). It is mainly through the mass media that the general public becomes aware of scientific advances, new therapies and the social and ethical issues regarding their use and availability. Because the media operate at this interface between science and society, reporting on scientific advances and technological developments in specific ways, they are likely to play an important role in shaping public perceptions of new technologies and their value and applications (Nelkin, 2001; Nisbet, 2007; Nisbet, Scheufele et al., 2002). An analysis of the way in which the British print media construct and interpret issues surrounding therapy and enhancement of brain function and the conceptual links they create between sleep and health, and the body and technology will presented in chapter 4.

In addition to media discourses and debates, the linguistic medico-scientific representations of medicine, illness, disease and the body are influential in the construction of both lay and medical knowledge and experiences (Nisbet & Mooney,

2007; Ettorre, 1999; Nelkin, 2001). How sleep, cognition and modafinil use are framed by scientific and medical experts will be discussed in chapter 5.

The importance of the context in which psychopharmaceuticals are prescribed or bought and used is acknowledged by some academics involved in neuroethical debates (Sahakian & Morein-Zamir, 2007; Racine & Forlini, 2009). Presently, the empirical evidence of how, when, why and by whom cognitive enhancers are used is limited and the extent to which psychopharmaceuticals are used for purposes of enhancement has not been subject to extensive empirical investigation. Therefore, it is difficult to evaluate the significance of the benefits or problems raised in neuroethical debate to (potential) end users[4]. Additionally, the ways in which psychopharmaceuticals are used within different sections of society and in different cultures is likely to be reflective of socio-cultural norms (Chatterjie, 2006; Malacrida, 2004). Chapters 6 and 7 aim to situate understandings of and attitudes towards modafinil use in social context in an attempt to further explore how the visions of contemporary/future society presented in the neuroethics literature compare and relate to how modafinil as an enhancement drug is understood by prospective users in the contexts of their everyday lives.

Chapter 8 draws the empirical findings of the study together to comment on how: modafinil is understood in social context in relation to existing practices and cultural norms; the role of medical expertise and medical control in the construction of both use and user; and the impacts of this type of technology on notions of self-governance and identity. It aims to contribute empirically to the emergent body of sociological work on medicalisation/pharmaceuticalisation of sleep and also in more general terms, to shed new light on the challenges new neurotechnologies pose to upholding a distinction between therapy and enhancement in contemporary society.

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[4] For further elaboration of this point see Martin & Ashcroft's discussion on 'The experience of neurotechnologies' (2005, p.24-26).

Chapter 2: Literature review

Introduction

As discussed in Chapter 1, the relationship between therapy and enhancement is complex. Enhancements are conceptualised on the one hand as going 'beyond health', therefore outside of the remit of medical authority and on the other as forms of medicalisation when augmentation of the body (or mind) is understood within a biomedical framework and performed through medical procedures or technology. Tension exists in demarcating legitimate use of medical resources from unjustified social control and in the separation of positive (or enhancing) and negative (or harmful) applications of the same substances outside of medical authority.

Numerous states that were once thought of as within the 'normal' range of human behaviours and conditions have been identified that are now thought of, at least partially, in terms of illness or disorder. These include shyness [Social Anxiety Disorder], height [Idiopathic Short Stature], small breasts [microstatia] and high body weight [obesity], to name but a few (Chang & Christakis, 2002; Hall, 2006; Scott, 2006). When considering traits and behaviours that can be altered via over-the-counter pharmaceutical products the list expands even further. Medicalisation is the term used to describe the process of 'making medical' (Conrad, 2007). In other words, a physical, biological or psychological condition or behaviour is said to be 'medicalised' when it is described within a (bio)medical framework, given a medical label (as an illness or disorder) or treated with a medical intervention (pharmacologic or otherwise). Theories of medicalisation can therefore be used to understand how new technologies, such as modafinil, come to be thought of, used for, and accepted as legitimate medical treatments. When thinking about non-medical uses of the drug, a newer term, pharmaceuticalisation, may be more applicable. Pharmaceuticalisation is used to describe the 'transformation of human conditions' into 'pharmaceutical matters of treatment or enhancement' which 'overlap with but extend far beyond the

realms of the medical or the medicalised' and 'serve to further blur the boundaries between treatment and enhancement' (Williams et al, 2008a).

There are a plethora of studies within the social sciences that address the issue of medicalisation focusing on various types, levels and consequences of the process. Whilst pharmaceuticalisation is still a relatively new term, interest in this phenomenon is also growing. Due to the vast quantity of medicalisation literature that exists, this chapter attempts to provide an overview rather than a review of all of the previous work in this area. Particular attention is paid to recent studies and debates concentrating on how the concepts of medicalisation and pharmaceuticalisation are being used to investigate the relationship between sleep, therapy and enhancement, before moving on to discuss the rationale for approaching this topic from an STS perspective.

Medicine, pharmaceuticals and society

Modafinil is presently available in the UK as a medicine, prescribed for the medical treatment of clinically defined disorders. For this reason, it is important to uncover how the various uses of this substance are being legitimated, promoted and restricted within the medical and scientific domains. This will contribute towards a greater understanding of how spaces for therapy and enhancement are being constructed and negotiated in contemporary society.

This section begins with an overview of sociological theory surrounding the role and influences of medical professionals and medicine in society. Firstly, the concept of medicalisation is introduced and literature discussing the role of the patient as consumer of medicine and the relationship between medicine and enhancement are presented. Following this, pharmaceuticalisation and the role of pharmaceuticals in society is discussed.

Medicalisation

According to Conrad (1992) medicalisation is a bi-directional and multi-faceted process that can occur on three distinct levels; the conceptual, institutional and interactional. It is at the conceptual level where the condition is defined through a medical framework as a (bio)medical problem. At the institutional level organisations may adopt a medical approach to treating a particular problem. The interactional level is where doctors are most involved in the medicalisation process, providing a medical diagnosis during a doctor-patient consultation or prescribing a medical treatment for a particular problem.

Early works on the medicalisation of everyday life were generally based upon a thesis of 'medical imperialism' – 'the increasing and illegitimate medicalisation of the social world' (Strong, 2006). The medicalisation thesis thus emerged as a critique of medical dominance and power. Medical professionals (and medical knowledge) were thought of as illegitimately extending their power and control into domains of social life outside of their competence as social problems came to be viewed through the prism of medicine and disease (Zola, 1972; Friedson, 1970; Illich, 1975). Within this framework, patients were conceptualised as passive targets of medical control and medicalisation was considered to be a negative process whereby the power of the medical profession removed autonomy from the patient to make decisions about their own healthcare.

How processes of medicalisation are defined and understood varies within the sociological literature. For instance, the description of a particular trait or behaviour in medical terms, the existence of a medical diagnosis and the availability of a medical treatment are not mutually exclusive for a condition to be referred to as medicalised (Conrad, 2007). Additionally, any definition of a problem in medical terms, or treatment by a medical intervention can be referred to as medicalisation, with or without the direct involvement or endorsement of medical professionals. By consequence,

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medical professionals are no longer viewed as the key to understanding medicalisation.   Some argue that any understanding of medicalisation that excludes the role played by the medical profession is invalid and highly flawed with such analyses loosing rigor and coherence (Davis, 2006). However, Conrad (2000) points out that several studies have shown that the medical profession, or even individual doctors may only be marginally involved in the medicalisation process and actual medical treatments are not a requisite for medicalisation to occur.

In recent years the medicalisation debate has moved on from a focus on medical imperialism to take into account the way that socio-cultural processes create a demand for medical definitions to make sense of everyday problems (Furedi, 2006). Current debates within medical sociology talk about the 'shifting engines' of medicalisation (Conrad, 2007) and how new drivers of the process include: the patient-consumer in search of diagnosis or a technological fix for a variety of self-diagnosed problems; the pharmaceutical industry aiming to expand their markets in order to sell more drugs in the pursuit of higher profits; and cultural influences such as the Internet and media which often cast problems and their solutions in the rhetoric of medicine, contributing to the process on a conceptual level by encouraging problems to be thought about in medical terms.

From patients to consumers of healthcare

Early proponents of the medicalisation thesis claimed that patients were passive targets of medical control. The decision of whether to prescribe medication or not is typically up to the doctor, however, this critique largely ignores that it is the patients' choice whether they seek medical advice in the first instance, and if prescribed treatment, whether they decide to take it (Strong, 2006). For example, in a review paper drawing together several qualitative studies on lay experiences of medicine taking, Pound et al. (2005) found that modifications to treatment regimens without prior discussions with medical professionals were common, dosages were generally

decreased by patients and medicines were often supplemented or replaced with non-pharmacological treatments. The study found the existence of widespread caution towards taking medicines based upon fears of adverse effects, worries about dependency, tolerance, addiction and potential harms of taking medicines in the long term. They conclude that the main reason why people do not take medications as prescribed is concern about the medicine itself, as opposed to a failing in communication, a lack of understanding or problematic doctor-patient relations. This study is interesting because, when thinking about the medical uses of modafinil in particular, it alerts the analyst to the agency of the 'patient'. This stance contrasts significantly with the image of the patient presented in the neuroethical discourse (Chapter 1), in which, therapeutic uses of drugs such as modafinil are typically presented as straightforward and acceptable. Social research into how patients actually consume medicines in the context of their daily lives highlights how this too is a complex and often problematic practice where the patient has autonomy and agency to decide both if and how they use prescription drugs.

Most medicalisation studies 'bracket off' the question as to whether medical intervention is beneficial for the patient, instead focusing on how and why such changes have come about. In taking this approach such studies do not take into account many of the normative or positive values associated with medical diagnosis and treatment such as recovery from illness, restoration of a socially acceptable health status and relief from pain (Furedi, 2006). Today it is often argued that one of the main drivers of the trend towards medicalisation is the transformation of the 'passive patient' into a consumer in search of a diagnosis (Tomnes, 2007; Furedi, 2006; Conrad, 2007). The users of medical technology, whether referred to as patients, consumers or some hybrid of the two, have become the focus of many medicalisation studies. It has been argued that it is often patient activists rather than professional bodies that campaign for medical labels to describe their conditions. The application of a medical label can provide legitimacy for those living with the illness to gain medical treatment (Lee, 2006) and may also help individuals make sense of their 'symptoms' (Furedi,

2006). Biological explanations of mental illness in particular can lead to de-stigmatisation and hope of new treatments (Lakoff, 2005). A number of studies have emerged in the field of science and technology studies (STS) that show how patient activists can assert their claims to be regarded as experts on their own illnesses in order to play a more active role in health-care decision making (Epstein, 1995). It is argued that such patient initiatives have resulted in significant changes in the practice of medicine.

Through the lens of the patient-consumer then, the conceptualisation of medicalisation as increasing domination and control of the designation of ill and healthy bodies is being re-envisioned as a collaborative process between doctors and patients that reconfigures the boundaries of acceptable behaviours and bodies (Tomnes, 2006). The rise of the active patient or patient-consumer is seen as a positive step in removing some authority from the medical profession (Lupton, 1997). However, according to Dingwall (2006) the fact that patient groups campaign for medical recognition of their conditions is somewhat inconsistent with claims of a decline in medical dominance. He argues that 'the would-be-sick who want their deviance labelled as unmotivated and deserving of social support still need the affirmation of the organised profession to sustain this claim' (Dingwall, 2006).

When one thinks carefully about the choices a patient-consumer has, especially the wealthy patient-consumer, in relation to the global healthcare market, to a certain extent the dynamics of the traditional doctor-patient relationship can be bypassed as individuals have the choice to seek out surgical procedures and therapies from practitioners willing to provide them. The patient-as-consumer has the power of choice: they are able to choose which service they require and where they go for it. For example, if a particular treatment is not available through the NHS (or covered by insurance in the USA) the consumer has the option of paying privately to receive it. If a condition is not recognised as a medical condition in the part of the world one lives or a procedure not available (e.g. penis extension, abortion) or legal in the country

they reside (e.g. euthanasia, egg donation), the consumer has the choice to perhaps even travel to other parts of the world to undergo medical treatment.

Despite this, as Lupton (1997) suggests, there are also likely to be times when the consumerist role is rejected in preference of the more traditional role of patient-as-recipient of expert knowledge. 'Passive' patients go to the doctor for information and expert advice, with both groups appreciating the asymmetry in knowledge and patients do not identify (or perhaps even resist) themselves as consumers in this context. However, the same individual can act as both consumer of health care and passive patient depending on context (Stevenson, Leontowitsch & Duggan, 2008). The focus of these studies on patient-consumers illustrate how users of technology can shape the demand for medical treatments for human problems, thus transforming medicine into a 'vehicle for self-improvement' (Conrad, 2007:140).

The biomedical era

Contemporary scholars often argue that the social role of medicine is changing from an institution that cares for and heals the sick to a tool for self-improvement in a society where people can (re)create themselves and their bodies in the fashion they choose. The term biomedicalisation is used to describe a recent shift in medicine taking place since the 1980s (Clarke, Fishman, Fosket, Mamo & Shim, 2003). In the biomedical era, new discourses within science and medicine promote the idea of an individualised body. The body is no longer thought of as stable and static but instead as flexible, it can be manipulated, reconfigured, moulded, sculpted and transformed (Martin, 1994; Rose, 1999). Biomedicalisation is based on the premise that everyone is 'at risk' of future ill health and this idea has become institutionalised through the medical surveillance of healthy populations where individuals are surveyed, screened, measured and tested in relation to medical ideals or pre-conceived standards of what is normal (Armstrong, 1995). At the same time, outside of medical encounters and institutions there is also thought to have been a shift in medical and political discourse

towards giving more responsibility for attaining health to the individual through health campaigns and initiatives as it becomes their responsibility to maintain or optimise their health through biomedicine.

In his early writings Nikolas Rose (1996) discusses how the self and the 'norms of selfhood'- autonomy, liberty, choice, and identity- have become central to the ways in which 'modern men and women have come to understand, experience and evaluate themselves, their actions, and their lives' (1996:1). Biomedicine has therefore opened up new possibilities for action on the self, creating new choices, identities and possibilities. Natural and artificial are combined as humans continue to transform themselves through technology; through this process not only is the body reshaped but also our 'sense of selves' (Gray, 2002; 191). There is then a type of biomedical governance at work that can act at the level of identity and social relationships altering subjectivities, providing us with new ways of understanding ourselves and our behaviours and shaping desires for transformed bodies and identities (Clarke et al., 2003; Rose, 1996; Gray, 2002). Whereas medicalisation describes the transformation of social deviance to illness and is centrally concerned with notions of control and normalisation, it has been argued that through processes of biomedicalisation bodies and identities (both individually and collectively) are 'customized, tailored and fundamentally transformed' (Clarke et al., 2003; 169).

Beyond therapy?

Clarke et al. (2003) argue that the customization[5] of bodies through tailor-made medicines, technologies and cosmetic surgery in addition to the proliferation of 'lifestyle drugs' mark the move away from medicine-as-therapy towards medicine-as-enhancement. Customisation is not only about improvement of bodies and

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[5] Other terms, besides customization, that are used in the sociological literature include augmentation, modification, remodelling (Wehling, 2005) and optimization (Conrad & Potter, 2004). 'Optimization' is also at the heart of the transhumanist project which projects an image of the body as flawed but perfectible through technoscience (Robitaille, 2008).

enhancement of bodily functions, but also about health promotion with information about susceptibilities, potential illnesses and preventative medicine. It has been argued that through biomedicine and new biomedical techniques of intervention 'we have become responsible for the design of our bodies' (Negrin, 2002; 37).

As discussed in Chapter 1, the use of medical technologies and procedures for self-improvement raises concerns about where the limits to medical authority over the body lie and the blurring of the boundary between therapy and enhancement (Parens, 1998). Recently, biomedical enhancement has been conceptualised as operating in three distinct ways: in terms of normalisation, bringing the body in line with a cultural norm; the repair and restoration of lost functions; or the (il)legitimate improvement of performance (Conrad & Potter, 2006). Concerns are raised that the use of biomedical technologies for enhancement purposes could increase the medicalisation of human problems, as the existence of medicalised solutions to these problems coupled with cultural attitudes and social values may contribute to shifts in the boundaries of what is considered 'normal' and acceptable. The social role of medicine in this case is conceptualised as one of amelioration against pain, suffering and discomfort.

However, over the past few decades medical procedures, for example, surgical remodelling of the body, have become detached from therapeutic contexts and goals of healing or repair, through successful advertising and media promotion. It is now commonplace to see invasive surgical procedures being used to alter or transform the body for the goals of boosting self-esteem, social recognition and even to advance one's career (e.g. glamour models and breast enlargements). Wehling (2005) argues that this demonstrates that a willingness to 'continuously shape and correct the body is set as a cultural norm' (2005; 7). Likewise, Conrad argues that 'the huge expansion of cosmetic surgery makes it abundantly clear that medicalised solutions to problems of the body are increasingly common and accepted in our society' (2007: 125). Others echo these sentiments when talking about the mind, arguing that we have already entered into an era where psychotropic drugs are used to treat mild symptoms and

improve upon cognitive functioning and emotional states that are well within the range currently seen as normal (Kramer, 1993). According to Conrad (2006) 'biomedical enhancements are one of the prime frontiers of consumer-driven medicalisation' and he predicts that this area is likely to grow extensively.

Although this suggests that optimisation and shaping of the self through technology is a positive process, Wehling (2005) argues that it does not necessarily mean that we can escape from cultural stereotypes and discriminations that exist in society. He points out that many current cosmetic surgery procedures still serve as means to alter or remove socially undesirable physical features that do not align with the current social norm (i.e. liposuction, nose augmentation, surgery to 'westernise' eyes). Therefore, new biomedical knowledge, techniques and practices do not only liberate but can also act to constrain behaviours and reinforce existing social or biomedical norms (Wehling, 2005). Through an historical analysis of the emergence and understanding of human growth hormone as an anti-aging therapy, Morrison's (2008) work shows how the boundary between therapy and enhancement shifts over time and between countries. Similarly, in their analysis of dichotomies between what was considered a 'natural' and an 'artificial' substance in elite sport, van Hilvoorde, Vos & de Wert (2007) argue that boundaries between 'natural' and 'enhanced' bodies are the product of institutional boundary work. Both therapy and enhancement, then, are understood in relation to socio-cultural conceptions of what is both 'normal' (as defined by scientific medicine) and desirable.

As discussed in Chapter 1, problems arise in practice when trying to demarcate technological intervention in terms of therapy or enhancement as the same activity could be classified as either a therapeutic or a non-therapeutic intervention depending upon the starting point of an individual relative to the 'norm'. Thus, both definitions rest on the assumption that a standard or 'normal' level of functioning can be identified. Importantly, these definitions have been shown to shift over time, shaping and at the same time being shaped in response to technological innovations such as new

pharmaceutical products (Morrison, 2008). Any definition of 'normal' health is likely to change as new therapies become available or standards of living change (President's Council on Bioethics, 2002). Additionally, illness is legitimated through definitions of normality proffered by the medical profession which differ socio-culturally and historically. Therefore definitions of 'normal health' are unlikely to be universally applicable considering that socio-cultural values are embedded within definitions of 'normality' which are constructed by medicine (Wolpe, 2002; Ettorre, 1999).

The development of new technologies, such as modafinil, that can alter states of consciousness can then influence (neuro)scientific and medical understandings of the mind and the body. As the medico-scientific gaze penetrates deeper into the mind, conceptualisations of normality, pathology, health and illness are subject to change (Foucault, 1989). Therefore, social and cultural values and our understandings of health and illness as well as bodies, mind and performance are all subject to alteration through technological developments. The power of medical knowledge, techniques and practices extends far beyond understanding illness to influence expectations of how we should look and behave and gives meaning to the way we experience the world around us. Conceptually then, it is difficult to demarcate therapy and enhancement or health and illness in a binary fashion. Instead these concepts can be understood as fluid and contingent, with diverse meanings that are socioculturally, historically and institutionally situated (Conrad, 2007).

Through taking account of the heterogeneous processes of medicalisation and the varied roles of medical professionals and patients/ consumers, in defining illness and creating demand for, enabling or restricting access to treatment, it becomes even more apparent how complex the relationship between therapy and enhancement is. The distinction between therapy and enhancement is blurred further through interventions that are still considered medical or therapeutic but are available outside of professional medical jurisdiction, for example, pharmaceuticals and other remedies that can be purchased over the counter (OTC), on the Internet or bought illegally

(Conrad, 2007; Williams et al., 2008a).   In the next section, literature discussing pharmaceuticals more generally will be introduced which is directly relevant to understanding the non-medical or extra-medical uses of pharmaceuticals in society.

Pharmaceuticalisation

Although scientific medicine still holds much power and cultural authority to define states of normality, health, illness and disease in the early 21st century, it would be ignorant to disregard the range of pharmaceutical technologies that are otherwise available to the consumer outside of the medical encounter. There are pills and potions available to treat a huge array of different everyday problems that one can buy OTC in the local pharmacy, from painkillers to decongestants, emergency contraceptive pills to weight loss drugs (Stevenson et al., 2008). These products are still manufactured by pharmaceutical companies and tested, regulated, labelled and packaged via much the same institutional mechanisms as prescription medication. However, who has access to these substances and the way in which they use them is much less restricted. In this cultural formation, the reason why someone experiences a problem or symptom becomes irrelevant. For instance, the painkiller and anti-inflammatory drug Aspirin can be used to treat symptoms of mild illness without needing a trip to the doctor, to alleviate the effects of an overindulgent lifestyle, as a preventative measure to prevent the formation of blood clots on long haul flights, or even as a compress to reduce the redness of pimples or insect bites. These examples demonstrate how, in the words of Andrew Lakoff (2005:10) psychopharmaceutical drugs are 'instruments whose function is shaped by the form of rationality in which they are deployed; they are means to various possible ends'. In relation to modafinil: a prescription pill which some argue should be available over OTC; the question arises as to what norms are used to decide who *should* use pharmaceuticals to augment cognition.

Through the availability of new neurotechnologies, it is not only the body but the brain and its various functions that are increasingly thought of as flexible and open to manipulation, pharmaceutical control and transformation (Martin, 1994). Pharmaceutical drugs are only one part of a larger assortment of medical technologies, which include various devices, discourses and talking therapies aimed at modulating physical, behavioural, psychological and emotional states. Lakoff (2005) devised the term 'pharmaceutical reason' to refer to the 'underlying rationale of drug intervention in the new biomedical psychiatry: that targeted drug treatment will restore the subject to a normal condition of cognition, affect or volition' (2005: 7).

Fox and Ward (2008) argue that over the past decade, instead of developing pharmaceuticals as medicines for disease and disorder, there has been a new emphasis on lifestyle in the production, marketing and consumption of pharmaceutical products. Their analysis draws attention to two processes at work: firstly, the domestication of pharmaceutical use, which they link to the availability of drugs via home computers and secondly; the marketing of pharmaceuticals as solutions to resolve a range of problems occurring in the private life of citizens. Two broad categories of 'lifestyle drugs' have been defined. Firstly, drugs that are designed to treat a condition which falls on the boundary between health and illness and has a direct lifestyle element (e.g. contraceptive pills; weight loss drugs); secondly, drugs that have been developed to treat a medical disorder but have secondary lifestyle uses (e.g. Statins) (Lexchin, 2001; Flower, 2004; Fox & Ward, 2008). It has been argued that the rise in profile and availability of so-called 'lifestyle drugs' is contributing to the pharmaceuticalisation of daily life as consumers come to see such substances as 'magic bullets' to resolve their everyday problems (Fox & Ward, 2008; Williams et al, 2008c). Like medicalisation, pharmaceuticalisation is a complex and multi-faceted process that involves many overlapping features including the biological impacts of the substance; the legitimacy of the target condition as a disease; the adoption of the drug by consumers as a solution to their specific problem in their everyday lives; and corporate interests.

Although pharmaceutical technologies that have been developed as medicines have a legitimate medical primary disease indication and are accessed via medical professionals, their usage can extend far beyond the treatment of disease or disorder to become ways of enhancing aspects of social life (Williams et al, 2008a). For example, drawing on empirical data, Fox and Ward (2008) illustrate how pharmaceutical products are not only consumed for medical reasons, but choices are made by consumers based on lifestyle. They refer to the weight loss drug Xenical, designed for the treatment of obese patients, that has allegedly found controversial uses as a method of sustaining a low body weight within pro-anorexia groups[6]. Viagra is probably the most iconic lifestyle drug, with several commentators arguing that the promotion of this substance was a test case, paving the way for pharmaceutical companies to manufacture products aimed at 'lifestyle' problems (Flower, 2004; Gilbert ,Walley & New, 2000; Lexchin, 2006; Moynihan, Heath & Henry, 2002).

Recent studies have shown that the location of sale of a drug (e.g. whether it has been prescribed for the treatment of a specific problem during a clinical encounter and is accessed via a pharmacist or is available as a consumer product on the supermarket shelves) has the potential to affect the way it is understood by the consumer (Harding & Taylor, 1997; Stevenson et al, 2008). In a 2001 study Bissell, Ward and Noyce examined consumer's abilities to self-manage several minor conditions using over-the-counter (OTC) pharmaceutical products, finding that the vast majority of their respondents held the belief that the availability of medicines OTC meant that they must be safe for consumption.

Despite the availability of many pharmaceutical products OTC, the most potent of these drugs are often highly regulated and tightly controlled, only being made available to the individual on the discretion of a medical professional (Fishman, 2004). A study by Fox, Ward and O'Rourke (2005) investigated consumer experiences and

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[6] Supporters of 'Pro-Ana' groups conceptualise anorexia nervosa as a lifestyle choice rejecting current medical understanding of the condition as a mental illness.

attitudes towards the consumption of pharmaceutical products through participation and interviews with users of an online forum. They found that despite many of the substances being mandated via prescription, consumers were still able to access the drugs via on online consultations using their home computer in a sense 'relocating consumption within the home' (Fox & Ward, 2008). Their analysis illustrates the importance of the local context in which pharmaceuticals are actually consumed and for what reason. They argue that even when prescribed in a clinical setting, pharmaceuticals are often consumed in the home as a way of treating private or embarrassing conditions that impact upon the daily lives of patients (they provide examples such as obesity, impotence and hair loss). They also acknowledge how such substances are rarely used in isolation, for example, information on diet and fat consumption is given to consumers alongside the weight loss drug Xenical (Fox & Ward, 2008). Their study highlights that the way in which pharmaceutical products are actually used in relation to other substances, artefacts and alongside various behaviours in social context can make a significant contribution to how pharmaceutical use is understood and whether this use is accepted, resisted, challenged or modified by the user.

Furthermore, in order to get new pharmaceutical products authorised, in both the UK and USA, regulators require a primary disease indication. For new drugs to be proved efficacious in clinical trials according to biomedical criteria, they have to target a clearly definable illness or disorder to measure improvements against (Lakoff, 2005; Fishman, 2004). By consequence, new diseases or disorders may be defined in order to legitimate new medical treatments and interventions. In these instances, medicalisation of a problem may in fact be a *requirement* for a particular drug to gain approval in the first instance (Clarke et al, 2003) if medical professionals act as 'gatekeepers' for its delivery (Conrad, 2007).This leads some to speculate that we live in a society where there is an 'ill for every pill' as pharmaceutical companies attempt to increase the markets for their products and legitimate consumption (Busfield, 2010).

Disease mongering

There has been much interest in recent years in the activities of the pharmaceutical and biotechnology industries, and the role they play in the redefinition of behaviours and states from 'within the normal range' into 'medical problems' that warrant pharmaceutical treatment. Pharmaceutical companies are often accused of 'disease mongering': 'the selling of sickness that widens the boundaries of illness and grows the markets for those who sell and deliver treatments' (Moynihan et al, 2002). Direct-to-consumer advertising in the US, and to a lesser extent, newspaper stories of 'wonder drugs' in the UK, market drugs directly to citizens who are encouraged to engage in 'healthcare consumerism' (Rose, 2007) and act as informed consumers participating in decisions about their healthcare by asking their doctor for a particular product for their self-diagnosis. The marketing of both drugs and their 'disease indications' is increasingly considered to be an important contributing factor in the medicalisation of specific conditions (Conrad, 2007). It is therefore, important to consider such corporate activities and interests in the extension of patient populations, namely increasing awareness of a particular disorder, that are likely to increase the number of individuals that present to the healthcare system.

Modern medicine is increasingly a technological medicine. Medical technologies are used to diagnose, detect, classify, treat and prevent disease (Waldby, 2000). In many cases the medicalisation of a problem is strongly linked to the availability and *profitability* of a chemical treatment for it. For example, the development of synthetic Human Growth Hormone (HGH) in the 1980s, a low-cost, high yield, safer alternative to cadaver extracted HGH, coupled with its successful marketing to medical professionals is considered to be one of the most important, if not the central factor, in driving forward the medicalisation of 'short stature' which now has the medical diagnosis Idiopathic Short Stature (ISS) and a medical treatment (Conrad, 2007; Hall, 2005; Morrison, 2008).

The official approval of pharmaceuticals to treat problems with a lifestyle component consequently legitimates both the problem and the pharmaceutical solution for it (Fishman, 2004; Clarke et al, 2003). Therefore the drug not only has a biological effect but also interacts with social and cultural forces that define a condition as problematic in the first instance (Fox & Ward, 2008). However, despite the efforts of the pharmaceutical industry in widening awareness of their products and expanding the therapeutic perimeter of their application (Lexchin, 2006; Moynihan et al, 2002), medical professionals still act as 'gatekeepers' for the prescription of most drugs, assessing whether the individual is in fact ill and in need of therapy (Dingwall, 2006). In contrast to medical imperialism, this might be indicative of how medical professionals can actually provide resistance to the 'pathologisation of everything' (Conrad, 2007).

To summarise the literature presented thus far, the relationship between therapy and enhancement is complex, especially in relation to pharmaceutical technologies which can be accessed outside of the medical encounter, but still used to treat some type of perceived problem or deficit (Wolpe, 2002). Although the very word 'enhancement' suggests that technological optimisation and shaping of the self is a positive process that allows the individual to free themselves from the constraints of their biology and transform their identity, there is still a form of biomedical governance at work shaping desires for how bodies, brains and identities should be transformed (Clarke et al, 2003; Wehling, 2005). The medicalisation and pharmaceuticalisation of daily life alongside the domestication of pharmaceutical consumption affects the ways in which elements of everyday life are understood and problematised.

Modafinil, sleep and society

This section provides a brief overview of the medicalisation/ pharmaceuticalisation literature directly relevant to the wake-promoting drug modafinil. As discussed in Chapter 1, the drug modafinil is being used as case study to provide a focus for this

research. Modafinil first came to the market as a pharmaceutical treatment for the rare sleep disorder narcolepsy in 1998. Since then it has reportedly been prescribed off-label to 'improve wakefulness' in a range of illnesses and conditions that involve fatigue, excessive sleepiness and cognitive impairment. Studies have also shown that its use can induce a variety of cognitive benefits in those without illness (Turner et al, 2003; Pigeau et al, 1995; Müller et al, 2004), although the efficacy of using the drug for this purpose has also been questioned (Randall et al, 2002). It is repeatedly claimed by bioethicists that this drug could potentially be taken by the general population to enhance cognition and reduce the need for sleep. However, a closer look at the prescribing information provided with the drug to patients and practitioners reveals that the drug is associated with a number of adverse side-effects, some of which are serious and life threatening, and the drug is considered to be open to abuse and misuse (Cephalon, 2008).

The potential for stimulants such as caffeine to promote wakefulness has been studied by scientists for decades. Some argue that the introduction of pharmaceuticals to replace caffeine as the wakefulness agent of choice is just the next step in an already established practice (Lawton, 2006). There is historical evidence to suggest that the development of technologies, such as the electric light bulb, have already caused one 'revolution' in natural sleep patterns (Ekrich, 2001). Claims are being made in the ethics literature and in the media alike that we are on the verge of another revolution, as a result of novel pharmaceuticals such as modafinil that can promote wakefulness and reduce the need for sleep. Recent examples of headlines encapsulating visions of a cognitively enhanced future world without sleep include "Get ready for 24-hour living" (New Scientist, 18th Feb 2006) and "Say goodbye to sleep" (The Sunday Times, 12th March 2006).

Because of the multitude of uses for the drug and the wide range of prospective users that are imagined across various social domains, modafinil can be used as case study to investigate the reception and uptake of these technologies within popular culture,

the role and function of medicine and pharmaceuticals in attempts to control sleep and enhance cognition and the normative implications this might have.

Medicalisation of sleep

Studies in the sociology of sleep (Taylor, 1993)- an emerging field of research – have investigated the commodification and commercialisation of sleep in modern consumer society (Williams & Boden, 2004); the 'doing of sleep' in a pragmatic sense (Williams, 2007a; 2007b; 2005); and the experiential embodiment of sleep (Meadows, Arber, Venn & Hislop, 2008) thus illustrate how sleep is being 'colonised' by 'various forms of expertise, with and beyond medicine' (Williams, 2002; 195). It is important, therefore, to bear in mind that studies that focus on the (prospective) medicalisation/ pharmaceuticalisation of sleep are only looking at one part of a much larger picture. However, many of the recent studies in this area have focused their attention on the medicalisation of sleep (Williams & Boden, 2004; Williams, 2004; Williams, 2002) asking 'Is sleep another chapter in the medicalisation story?' (Williams, 2002:173).

Culturally many behaviours associated with sleep are becoming less and less socially acceptable with the most somnolent bodies being redefined in (bio)medical terms and subject to pharmacological and/or psychiatric treatment. This 'medicalisation' of sleep has been investigated sociologically at different levels and across different sites: at the organisational level with the creation of specialised sleep clinics (Moreira, 2006); the interactional level in for example, the context of the doctor-patient relationship (Hislop & Arber, 2003); and at a conceptual level through media discourses and debates about sleep problems (Kroll-Smith, 2003; Woloshin & Schwartz, 2006; Williams et al. 2008a).

Concerns have been raised within the sleep science community regarding the lack of attention given to sleep issues by the medical profession (Dement & Vaughan, 2000) and the disparity between the volume of popular texts and clinical attention to sleep

problems (Kroll-Smith, 2003). In addition, studies have found that information about sleepiness and sleep disorders found in popular texts, on the Internet and in the media is often cast in the rhetoric of medicine (Kroll-Smith, 2003). The media, then, come to the fore as an important site in which to investigate the medicalisation of sleepiness outside of the medical encounter. Investigating the roles of the media in the medicalisation of sleep has attracted some sociological attention. Recent research has investigated: the way the media report on diseases and its role in 'disease mongering' (Woloshin & Schwartz, 2006); the rhetorical authority presented in the media and its role in shaping perceptions of disease (Kroll-Smith, 2003); and the social construction of sleep disorders in the media (Seale, Boden, Williams, Lowe & Steinberg, 2007; Williams et al, 2008b) and their treatments (Williams et al, 2008a).

In a recent study, Kroll-Smith & Gunter (2005) focus their attention on 'the emergence of a new truth about sleepiness' in a society they deem to be increasingly organised around expertise and its representation in visual and print media. They argue that somnolence, once considered a benign state of being and a naturally occurring corporeal precursor to sleep, is increasingly being represented as a potentially hazardous and morally reproachable problem of public concern. They found that this new representation of sleepiness was emerging in society from several, seemingly unrelated sources including scientific studies, social movement literatures, magazines, newspapers and websites. Williams (2002) analysis shows that sleep in general is increasingly associated with issues of health and wellbeing, while specifically the diagnosis and treatment of many sleep problems is falling under the jurisdiction of medicine.

In his analysis of the relationship between sleep and health, Moreira (2006) explores the emergence of the sleep disorder Obstructive Sleep Apnoea Syndrome (OSAS) and the social shaping of a medical treatment for this condition, continuous positive airway pressure (CPAP). He suggests that as disordered breathing during sleep coupled with loud snoring and excessive daytime sleepiness in a typically obese body

came under the purview of scientific medicine, these behaviours were defined as symptoms of upper airway respiratory problems during sleep. The study of these problems focused on apnoeas- periods where the individual stops breathing- and a new disorder called OSAS was defined. Viewed through the lens of medicine, the body of the once slothful, overweight and antisocial sleeper was reconfigured in terms of disorder, defined as ill and in need of treatment. Rather than assigning culpability to an individual's weight, obesity came to be understood as a risk factor for the disorder.

The medicalisation of sleep in the case of OSAS is apparent conceptually with the emergence of a medical definition to describe particular sleep behaviours; at an interactional level with OSAS being diagnosed and CPAP prescribed by medical professionals; and institutionally with the training of clinicians to recognise the disorder, the creation of respiratory sleep clinics and research and development into novel treatments. In fact, the medical definition of OSAS has been referred to as the 'official birthday of the clinical, scientific discipline of sleep disorders medicine' (Dement & Vaughan, 2000). However, Moreira (2006) argues that using the concept of medicalisation alone is not sufficient to understand the complex set of relations between researchers, clinicians and patients and how they 'interactively deploy the knowledge, techniques and technologies through which different sleep problems are understood and managed' (2006:61). He goes on to argue that an STS perspective that takes into account the social shaping of scientific knowledge and technological development and the way they in turn shape social, economic and political organisation can be used to aid in understanding the 'complex processes of contestation and heterogeneity that are recognisably at the heart of the medicalisation process' (2006: 61). The value of STS approaches to studying the medicalisation of sleep as related to modafinil use will be returned to and discussed further later.

In their study on women's management of sleep problems, Hislop & Arber (2004) also attempt to go 'beyond medicalisation' to highlight the importance of 'personalised strategies' for managing sleep. They argue that such strategies exist outside of

'medicalised' or 'healthicised' strategies that are promoted in popular culture and may even indicate the demedicalisation of particular aspects of sleep. However, through a study of the social construction of sleep in the UK media, Seale et al (2007) provide some evidence that many constituents of even so- called 'personalised strategies' for dealing with sleep problems can be traced back to narratives found in popular culture. Williams (2004) argues that whilst Hislop and Arber's study is illuminating, they conflate the different levels of medicalisation in their analysis and that further detailed sociological analysis is required before any conclusions can be reached regarding the demedicalisation of sleep problems.

Pharmaceuticalisation of alertness

Previous sociological research has investigated the medicalisation/ pharmaceuticalisation of alertness also using modafinil as a case study. Williams et al (2008a) locate their study of modafinil in the British print media within recent sociological work on the role of the media in relation to pharmaceuticals. They focus their study on investigating the role of the media in the medicalisation or pharmaceuticalisation of alertness and the governance of sleepy bodies in contemporary culture. Their analysis focuses on four main themes that emerged from the data, the first being the use of modafinil to treat medical conditions. They describe how the voices of sleep experts and doctors were frequently used in the media sample to construct modafinil as a 'wonder drug' for medical conditions such as narcolepsy, and show in their analysis that new clinical uses of modafinil, such as its use for the treatment of SWSD, are legitimised through medical rhetoric. The second theme 'lifestyle choices and party people' focuses on concerns raised in the press over the potential for modafinil to blur the boundaries between treatment of legitimate medical conditions and for 'uses and abuses as a (lifestyle) drug of choice' (2008b: 7). The third theme focuses on the use of modafinil in military operations including the way sleep is framed in the media in terms of a 'commodity of war'. In the final theme entitled '(Un)fair competition? The race to get ahead' Williams et al (2008a:12) discuss

among other things, how 'bogus appeals' are made to medical conditions by athletes as (il)legitimate grounds for using this drug.

They argue that the media is a key way 'if not the key way' of mediating a pharmaceutical to the public in the UK where direct-to-consumer advertising is prohibited. However, they question the extent to which this can be viewed as 'extra-institutional' drawing reference to the frequency that sleep experts and doctors are referred to and indeed the traditional doctor-patient relationship is used in the media as a framing device for these stories. In their conclusion the authors alert us to 'the limits of a solely or strictly medicalised interpretation of these issues'. Instead they interpret the way media debates and discourses are organised around non-medical uses and abuses of the drug as 'articulation or amplification of a series of cultural anxieties about the *pharmaceuticalisation* rather than the medicalisation of alertness, sleepiness and everyday/night life' (2008; 13, emphasis in original).

Although not specifically related to the pharmaceuticalisation of alertness, some other studies have taken a sociological perspective to investigate the use of pharmaceuticals to alter cognitive states. Of most significance here is the work of Ilina Singh on the use of Ritalin (methylphenidate) to treat children with ADHD. Despite much debate in the bioethics literature (outlined in Chapter 1) about the over-use of medications such as Ritalin in children to achieve social goals, Singh's (2004; 2005) work on boys who were prescribed Ritalin as a treatment for ADHD is one of the few studies which investigates the experiences of those taking the drug. Singh interviewed parents whose children were prescribed Ritalin and studied their justifications for giving their child the drug. She found that parental discourse surrounding the decision of whether to give their child Ritalin had a strong moral dimension relating to ideas of authenticity and personal freedom. Whilst many mothers saw the drugs effect as treating a problem located in the brain and thus allowing their sons' 'true self' to appear, others described how they would give their child breaks from the medication on the weekends for example, so the 'real' or authentic child could spend time with the

family (Singh, 2005). In these cases, drug use was thought of as creating a false or modified self for their sons. Singh argues that therapeutic decisions are guided by moral conceptions of authenticity and personal freedom whilst also being embedded in cultural ideology, in this case related to ideas about parenthood, masculinity, self-actualization and success. Singh's analysis demonstrates, as shall be discussed further in the next section, how technologies are not neutral artefacts, but are designed, developed and promoted for specific reasons and therefore embody social, cultural and political values. It also highlights how people can construct ethical concepts (in this case, the concept of authenticity) in several different ways. It can therefore be argued that this raises questions about their validity as transcendental moral categories and highlights the need to ground ethical debates about the uses of pharmaceuticals such as modafinil and Ritalin, in their social contexts (Martin and Ashcroft 2005; Singh, 2004).

To summarise, using the concept of (bio)medicalisation to analyse the emergence of new sleep disorders and therapeutics enables one to build an understanding of how the realm of sleep (and sleepiness), once considered a private corporeal form of existence, has begun to fall under the jurisdiction of medical authority. Although finding this concept useful, many scholars attempt to go 'beyond medicalisation' in various ways to take account of other practices and processes that may aid in explanations.

Williams et al (2008a) argue that the media coverage of modafinil is best interpreted in terms of 'pharmaceuticalisation' rather than 'medicalisation' as the non-medical use of modafinil for enhancement purposes goes beyond the medicalisation debate. However, as discussed above, the relationship between therapy and enhancement is not straightforward, and enhancement uses are not always conceptualised as being incompatible with medical supervision of the technology (e.g. cosmetic surgery). To separate out pharmaceuticalisation and medicalisation may be appropriate in certain circumstances. However, this research is interested in uncovering different

representations of sleep, modafinil and the body that act to frame pharmaceutical use in specific ways. It will take into account how these different frames act to include or exclude medicalised narratives with the aim of examining the role played by medical authority in the legitimation of uses of the drug use across different social contexts. Although questions regarding the pharmaceutical regulation of sleepiness may well take us 'beyond the realms of the strictly medical or medicalised', attention to how medical authority is deployed, how pharmaceutical use is constructed across different social contexts and the role of this in further medicalisation of sleep is important and cannot easily be dismissed.

Others, such as Moreira (2006) argue that an STS approach that takes into account the social shaping of scientific knowledge and technological development and the way they in turn shape social, economic and political organisation can be used to aid in understanding the complexities of the medicalisation process. An STS approach is also adopted in this research to analyse the phenomenon of cognitive enhancement and the specific case of modafinil. The rationale behind this analytical choice is discussed in the following section.

Science, technology and society

In the above sections discussing the concepts of medicalisation and pharmaceuticalisation it was argued that pharmaceutical technologies do not act in a vacuum, they are developed and used by people in the context of their everyday lives and therefore can be understood in different ways and used for different purposes (Lakoff, 2005). In this section STS literature will be introduced to argue that even though this might be the case, technologies are not neutral artefacts. They are designed and developed for specific uses with a specific group of users in mind. Therefore, the distinction between what is 'social' and what is 'technical' is often difficult to make.

Co-production of science, technology and society

The field of STS views science and technology as actively constructed through interaction with society. According to Law (1987) the builders of technology have to simultaneously build their artefacts and the environments in which they function. This idea forms the basis of theories of the social construction of technology: that there is no intrinsic logic to technology and that the working of technology is only partly explained by technical functioning and must also be explained by social factors. Researchers in STS formed the concept of 'technoscience' to encompass the simultaneously social, technical and cultural nature of all artefacts (Sismondo, 2004). This concept is built upon theories of the 'co-production' of science and society (Jasanoff, 2004) that challenge both natural and social determinism, arguing that we gain explanatory power in thinking about natural and social orders being produced together. According to Jasanoff (2004), knowledge simultaneously embeds and is embedded in the social. She argues that co-production is symmetrical as it draws attention to both the social dimensions of knowledge production and the cognitive and material connections to social arrangements.

New reproductive technologies can be used to illustrate the co-production and mutual shaping of science, technology and society. These technologies enable infertile or same-sex couples to have children through the processes of egg donation or surrogacy, whilst pre-natal genetic screening technologies make it possible for parents to choose the sex of their future child before becoming pregnant. Although the technology exists, some of these practices and procedures remain controversial. The social implications of such applications are strong and far-reaching, for example, encouraging the redefinition of the traditional family unit. These technologies are being developed to 'fix' social problems (e.g. of infertility); however, some scholars argue that their existence puts increasing pressure on women to try to fulfil their social role in becoming mothers, reinforcing the need for the technology and its continued development (Bauchspies, Croissant & Restivo, 2005). This example demonstrates

how technologies are developed within a social, cultural and political context where particular social norms and values frame how certain aspects of human life or behaviours are understood. The way in which a problem is framed influences the range of solutions thought of as possible and influences the development of technological fixes for these problems. The existence of a technological solution for a particular problem then feeds back into the system and can reinforce the values and norms that lead to the conceptualisation of the particular phenomenon or behaviour as being problematic in the first instance.

Successful technologies depend on the mobilisation of both social and material networks. As such, when adopting an STS perspective, technologies are studied in their context of use to take into account how they are embedded in a complex web of sociotechnical artefacts and relationships with diverse cultural meanings. An STS analysis can therefore be used to take into account not only the technical artefact but also the social and cultural factors that shape technological development.

Technologies and their scripts for use

Winner argues (1980; 1993) that technologies are not neutral: values and politics are incorporated into the design process so that technologies embody the interests of their designers. Therefore, technologies come with social scripts for how they should be used. Bauchspies, Croissant & Restivo (2005) discuss the neutrality of technology using the well known phrase "Guns don't kill people, people kill people". They argue that intentions are designed into technological systems and that guns are designed to kill, therefore social values are reflected in technological design and there is cultural meaning attached to technology.

Pinch and Bijker (1987) developed ideas about the social construction of technology (SCOT) arguing that both users and manufacturers play a part in how a technology is constructed. They introduced the notion of interpretative flexibility. Put simply, this

suggests that different groups of actors or individuals can construct alternative meanings for a technology. Many early studies using the SCOT approach looked at technologies during the developmental stages and focused on understanding how such flexibility was closed down to reach a stable interpretation of the technology (Pinch and Bijker, 1987). Later studies took a more symmetrical approach taking into account the co-construction or mutual shaping of both technologies and users (Oudshoon and Pinch, 2005). From STS perspectives, users of technology are not passive consumers, but actively engaged in shaping how technology is positioned, negotiated and understood in social context. Many studies in the field of STS place great importance on the relationship between technology and prospective users in attempts to situate technology within its social and cultural contexts. It is through the user then that possible connections between the social and technical are demonstrated.

A focus on users of technology

In a now classic paper entitled 'configuring the user' Steve Woolgar (1991) explains the relationship between a technology, its creators and prospective users through the metaphor of 'machine as text'. He uses this metaphor to explain how technological artefacts are designed and created (or written) to be used (or read) by particular users in a specific way. He proposes that the relationship between innovators and users of technology is then mediated by the machine and what it can do. He argues that a technology is organised in such a way that its intended use is apparent to the user. And further to this, that in the design process it is not only the machine that is constructed but also the prospective user as other design activities attempt to define the user, their likely future requirements and set parameters on the users' actions.

According to Woolgar (1991) neither configuration of user nor machine is settled or established; interaction invites assessment as to whether the user is acting as an appropriate user and the machine as a 'real' machine. However, Woolgar (1991) does

acknowledge that in the process of reading of a technology it is opened up to flexible interpretations and users might find novel or unexpected uses for the artefact. In the context of his case study of the development of a new microcomputer, he argues that not all interpretations of technology are equally valid, with unexpected uses of technology considered bizarre and these users as violating the configured relationships they have entered in to.

Continuing with the textual metaphor, Akrich (1992) discusses the idea that technologies come with scripts for use. She proposes that during the design phase manufacturers envisage who the users of the artefact will be, imagining their motivations for using the technology and even their specific tastes, competencies and political prejudices. She argues that this vision of the world becomes inscribed into the technical object through its design features, in a sense building or scripting into the artefact how it should be used. Drawing on Actor Network Theory (ANT) to avoid giving determining agency to either technological or social actors, Akrich argues that users take their place within a cast of roles designated by the producers of technology that prescribe how a technology should be used. However, she argues that through alternative use of technology users can re-write these scripts. Mallard (2005) refers to this disjuncture between how prospective users for a technology are imagined and the ways in which the artefact is eventually used as 'users drift'.

Both Woolgar and Akrich focus on analysing representations of the user by designers of technology during the early stages of the innovation process. More recent studies view users as much more active in the construction of their identity and particular relationship with the technology. For instance, in a study examining the continued use of outdated computing equipment (the TRS-80, which was rendered obsolete by most users in the 1970s) within a small community of users, Lindsay (2005) analyses how different representations of the user interact within different social groups. She argues that images of the user and technology are dynamically co-constructed by different groups throughout the whole life history of a technology (so not just in the innovation

or introductory stages) and demonstrates how user-technology relationships are (to some extent at least) mediated by such images of the user.

In a recent paper Wilkie & Michael (2009) discuss the figure of the future user in policy discourse surrounding new communications technology. Bringing together STS literature on both users and futures (e.g. Brown & Michael, 2003) they argue that the figure of the future user is performative. In their analysis they explore how future users of an emerging technology are constructed in various ways, arguing that how the future user is imagined both embodies and delimits a range of future possibilities, in the case of their study this was different policy options. They conclude that specific configurations of the future user depicted as inhabiting particular sociotechnical futures can then directly influence the present through the direction of policies and therefore contribute to shaping the future. Similarly, Borup, Brown, Konrad and van Lente (2006) argue that expectations of future users are literally and materially scripted into technologies and socio-technical systems. How the prospective user is imagined is therefore of relevance to all studies of new and emerging technologies.

Understanding non-use is also an important area of research that often has strong political motivations, especially in the health arena where uptake of medical technologies (e.g. vaccinations) and other services may be lower than anticipated or desired among particular social groups. Often in policy and ethical discussion non-use of technology is associated with inequality and deprivation. Non-users emerge in debates around access to new technologies with two groups proposed- the 'haves' and 'have nots'- and it is often assumed that all non-users want to become users (Wyatt, 2005). The idea of non-use is explored further in a recent paper by Wyatt (2005) where she looks more closely at the so-called 'digital divide' between users and non-users of the internet. In her analysis she identifies four different types of non-use: resistance (prospective user is against prescribed use of the technology); rejection (prospective user chooses not to use technology in favour of other alternatives); exclusion (non-users who do not have access to the technology); and

expulsion (users who are no longer able to use the technology for a variety of reasons). She believes that whilst focusing on users is important, without taking into account the various forms of non-use one risks following the dominant actors and argues that non-users and former users should be taken seriously as relevant social groups as they too can shape technology and society.

Medical technologies

STS perspectives acknowledge that medical technologies do not exist in isolation or a social vacuum. They are manufactured, sanctioned and deployed within various networks of social actors; including hospitals, surgeries, patients, insurers, laboratories, governments, regulatory agencies, funders and so on. The acceptance or rejection of technology is then reliant upon not only if it works in a technical sense, but also how compatible it is or if it can be shaped to suit the requirements of the different parties involved. An example here comes from Locke (2001) and her study of organ transplantation technology in Japan where until relatively recently transplant technology was not being utilised.

In 1997 Japan's Organ Transplantation Law was passed, permitting people to choose between brain death and traditional death by writing their preference on a donor card (Trends in Japan, 1999). This meant that organs could be removed from coma patients (who had previously consented) who were classified as 'brain dead' and used for transplant. Despite this, relatively few organs were either donated or transplanted in the years following. According to Locke (2001), in traditional Japanese culture, death is a socially determined process not just a biological event. The concept of reciprocity is strong within Japanese culture so notions of charity and anonymous donation of a human organ breaks through a strong cultural tradition. This example illustrates that the existence of a technology alone is not sufficient for its acceptance in society. The technology may work in a technical sense but be rejected on a cultural basis.

In modern scientific medicine normality and abnormality are measured and defined through technologies which are used to visualise the body and the mind in a specific way. These technologies are not passive; they are created and designed for a specific purpose, for use within a particular social context and to meet a particular goal (Mackenzie and Wacjman, 1999). However, medical technologies are complex entities; the way they are interpreted is not static as they are shaped by and in turn shape medical knowledge. An interesting example comes from Rachel Maines' (2001) study of the history of the vibrator, which describes the development of this technology as a medical treatment for hysteria in the 19th century. As the diagnostic category went out of favour in the early 20th century, Maines documents how the vibrator shifted from being positioned as a medical therapeutic under professional authority used to treat a medical disorder in the clinic to a non-medical device used to enhance sexual pleasure in the private lives of ordinary citizens. Maines (2001) research shows how technology can be interpreted in relation to contemporary theories and knowledge claims and clearly illustrates the importance of social and cultural processes in the (de)medicalisation of human conditions and the legitimacy of technological interventions. Further than this, though, it illustrates that how medical technologies are understood, positioned and used can shift over time in accordance with contemporary knowledge claims, social values and cultural norms.

A more contemporary case is that of contraceptive pills which, once only available on discretion of a doctor for use by women to prevent unwanted pregnancy (which is itself a medicalised social problem) are on now on their way to becoming an OTC product available to all. Presently, this technology does remain under institutional expertise (of nurses and pharmacists) and has a literal script for use written down by manufacturers and included in its packaging. However, 'users drift' (Mallard, 2005) is well documented as women of all ages use the pills in unanticipated ways for example, to prevent outbreaks of acne or delay menstruation until a socially desirable time. This

perhaps contributes to a conceptual transformation of these pills from medicine to consumer product in popular consciousness.

Modafinil as a medical technology

Thinking back to Lakoff's (2005) position, that pharmaceutical technologies are means to various possible ends, from an STS perspective this becomes more problematic to accept at face value. Technologies do not exist in isolation, they have been designed, developed, tested, manufactured and are sold, bought and consumed within socio-technical networks that give meaning to their use and non-use. A modafinil pill is not simply an amalgamation of its active ingredients. It is a medical technology that exists within complex social-technical systems that include chemical laboratories, guidelines and approval, companies, culture, law, doctors, patients, journalists and so on. Medical technologies embody various social and cultural understandings of the kinds of bodies they are interacting with, the disease, illness or trait being targeted, and what is normal or desirable (Nichter and Vockovitch, 1994). They form a link between the actions of individuals and how they understand their bodies and functioning and how disease and disorders are formed through scientific medicine (Morrison, 2008).

Pharmaceutical technologies are not neutral; they are coded with ideologies about the social lives, relationships, self image and characteristics of their consumers (Rose, 2007; Lakoff, 2005, Kramer, 1997). For instance, it has been argued that in its privileging of penetrative sex, Viagra is a technology that is coded with specific images of sexuality and masculinity (Potts et al, 2003). Rose (2007) points out that the effects of a drug 'are not simply given in the drug: they are embedded in complex situations and the affects they generate require all manner of social and contextual supports'.

Although modafinil could be flexibly interpreted and used in different ways for different ends, not all interpretations of technology will be equally valid and unexpected uses of the technology could be considered bizarre or these users as violating the configured

relationships they have entered in to (Woolgar, 1991). Monaghan's research explores one such violation of a technology-user relationship in relation to pharmaceuticals: the use of steroids by bodybuilders' for the purposes of building muscle mass. Through interviews with Bodybuilders he found that although acknowledged as 'risky', steroid use within this group was rationalised in several different ways by actual users as being a legitimate means to achieve an end goal. Studies such as this one demonstrate how it is imperative to explore not only the official discourses of healthcare professionals and 'experts' but also the social meanings which users themselves attach to their drug taking practices in order to appreciate and understand why people behave as they do (Monaghan, 2002).

To summarise, medical technologies come with scripts for how and why they should be used: to relieve pain and suffering, to attempt to restore normality with the goal of achieving health or preventing illness. There may be one dominant use of a technology, one that is configured, scripted or prescribed by its manufacturers. However, STS studies that focus on how users actually use, modify, domesticate or resist technologies clearly demonstrate that a single fundamental use cannot be deduced from the artefact itself (Oudshoon and Pinch, 2005). The studies discussed above demonstrate how the figure of the user, be that actual, prospective, future, proscribed or non-user, provide useful analytical foci through which to understand the acceptance or rejection of new technologies in their context of use.

Conclusion

Medicalisation and pharmaceuticalisation are complex and multi-faceted processes which can occur in various ways, at a range of sites and have diverse implications for different groups. Over recent years there has been a shift from medicalisation as a critique of medical imperialism to focus on the interplay of a variety of social actors in driving the process forward and indeed, in reverse. However, in most instances medical professionals still retain their role as 'gatekeepers' to expert knowledge

regarding health and illness and can sometimes be seen as providing resistance to over-medicalisation. Through the process of medicalisation human differences are transformed into pathologies, diagnosable disorders and treatable conditions. The definition of medical norms through the existence of new scientific knowledge and/or new medical treatments may change perceptions of how the human body functions and importantly, influence social and cultural expectations of how the body *should* function.

The users of medical technology have become an analytical focus for many contemporary medicalisation studies. Patients or consumers of medicine have come to be seen as one of the drivers of the medicalisation process searching for diagnosis and treatment. Outside of the traditional institutional boundaries of the medical profession, studies focus on consumers of pharmaceutical products as these become domesticated and available in their everyday life.

As the body and its parts become the objects of commodification and regulation and are subjected to technological applications, they are framed in particular ways according to current social and cultural trends. Therefore, the interpretation of the body can also be said to be socially shaped. Studies in STS have shown that technologies are social, that they are shaped by their designers to fit into a social role within a broader cultural context. As cultural norms and values change so too do the social problems that are faced and the technological fixes that are developed. To understand the impact of technological development on society one must take into account not only technical changes but also the social, political, cultural and economic factors involved. An STS analysis can provide a critique of technological applications and challenge the nature of technology showing that technology is not neutral, but is designed and promoted in certain ways for particular effects. It can shed light on why controversies around new technologies might arise through the drawing of different boundaries which impose different social, ethical and legal constraints onto a situation.

Informed by previous work in both medical sociology and bioethics, the debate around medical and non-medical uses of modafinil will be approached from an STS perspective. The analytical framework will focus on the interaction between technology and prospective users to understand how pharmaceuticals with both therapeutic and enhancement potential are understood, positioned and negotiated in social context. In adopting this approach, this research aims to contribute to the emerging literature on the medicalisation and pharmaceuticalisation of sleep and also in more general terms, to shed new light on the therapy/enhancement debate.

The core research question this project aims to address is: How is the use of the drug modafinil to augment human cognition understood within the mass media, by researchers and potential users, and what implications does this have for debates about enhancement technologies?

The aims of the study, outlined in Chapter 1, have been operationalised into specific research questions. The specific research questions relevant to each of the four data chapters are outlined at the beginning of each data chapter and include the following:

- How are sleep, cognition and the body conceptualised in different social contexts and by different stakeholder groups?
- How is modafinil use understood, positioned and negotiated in each of these domains? What sociotechnical scripts are associated with modafinil use and how is it positioned as a medical or non-medical technology?
- According to what norms do different groups believe that augmentation of the mind should take place? What role is given to medical authority in deciding if particular uses are acceptable?
- In the light of these empirical findings does the maintenance of a therapy/ enhancement dichotomy remain viable when discussing the various uses of cognition enhancing drugs? What are the implications for the idea of (bio)medicalisation?

Chapter 3: Methods

Introduction

The aim of this research project is to explore the issue of cognitive enhancement from the perspective of different stakeholders in order to assess the viability of framing the debate around medical and non-medical uses of cognition enhancing drugs through a therapy/enhancement dichotomy and uncover the implications of this for the idea of (bio)medicalisation. The research focuses on one drug, modafinil, as a case study to investigate how different uses of neurotechnologies to alter brain functioning are understood, positioned and negotiated in social context in contemporary society. Through a focus on use and users of technology (as discussed in Chapter 2) the approach taken intends to produce an in-depth and critical account of how such uses are understood outside of professional bioethical discourse (as outlined in Chapter 1). This research approaches the topic for investigation from a perspective rooted in the ontology and epistemology of Science and Technology Studies (STS), understanding both science and society in terms of co-production. This position will be explained in more detail in the next section. The remainder of the chapter will focus on the methods used for data collection and analysis.

Philosophical standpoint

The theoretical approach adopted in this study to analyse modafinil as a medical/ non-medical technology in social context was informed by theories and draws upon analytical concepts from the medical sociology and STS literatures. STS perspectives could be broadly termed constructivist, viewing science and technology as social and active (Hacking, 1999; Sismondo, 2006). STS perspectives adopt a symmetrical approach to data analysis. Instead of upholding the traditional dichotomies of nature-culture, fact- value and structure- agency, STS approaches favour co-production which recognises that all knowledge is socially situated, constituted and constrained

(Bijker, 1993). According to this standpoint, no knowledge is ever value-free. Epistemologically, the consequence of this position is that the phenomena under investigation are considered not to have a static decontextual or uncoverable existence. Facts are understood as contingent, the success of a particular science or technology is not a given, but entwined with human choices and obligations (Sismondo, 2006).

At the level of ontology, truth does not have absolute foundations in the natural world, there is no knowledge or truth that is true for all people at all times. Instead truth is more dependent upon who articulates that truth, how it is discovered and represented and the norms and conditions in the social and historical traditions within which it was formed (Rorty, 1999). A problem related to adopting this stance is that all truth must then be recognised as being context dependent (Hughes & Sharrock, 1997). Any attempts to understand social reality must then be grounded in people's experiences of that reality (Bryman, 1988). However, this does not mean that ontologically, one must then take a relativist stance where all truths are considered to be the product of subjective social and cultural process and that any one account of a phenomenon is as valid as any other, to a large extent ignoring the materiality of the social world (Murphy & Dingwall, 2003). When taking an STS perspective, the physical effects, material properties of objects and the conditions and constraints these pose on how they are understood (their meanings) are fully acknowledged and taken into account (Morrison, 2008; Mackenzie & Wacjman, 1999).

The ontological position this research therefore takes is closer to what has been termed a 'critical realist' perspective which takes into account the materiality of the social world whilst acknowledging that multiple meanings and understandings (or divergent frames of reference) can co-exist in and between groups and that not all accounts will be equally valid (Dingwall & Murphy, 1998). Therefore, in adopting this position epistemologically, the analyst attends to both the social dimensions of

knowledge production and the cognitive and material connections on which this production is based (Jasanoff, 2004).

Research design

Although often set in opposition to one another, the critical realist perspective adopted in this study does not view qualitative and quantitative research as belonging to opposing paradigms (Silverman, 1997). When taking this view, according to Hammersley (1992: 163):

'…we are not faced with a choice between words and numbers...our decisions about what level of precision is appropriate in relation to any particular claim should depend on the nature of what we are trying to describe, on the likely accuracy of our descriptions, on our purposes, and on the resources available to us; not on ideological commitment to one methodological paradigm or another'.

Qualitative research aims to provide in-depth explorations of the meanings people attach to their experiences in a particular social domain and the way in which social structures and processes may shape these meanings (Bryman, 1992). Qualitative methods are therefore best suited to research questions that ask why and how rather than those which seek to establish facts or measure effects, for example addressing when or how often a particular phenomenon is occurring. Qualitative methods emphasise context and display a commitment to viewing the subject of investigation from the perspective of the people being studied (Bryman, 1988). Qualitative methods are generally more flexible than quantitative approaches, enabling research participants to explore subjects of importance to them, define issues in their own vocabularies and generate and pursue topics of interest in their own terms.

Following this conception, as this research seeks to describe and explain perspectives, understandings and behaviours and how they are influenced by social context (and the values and norms operating within that context), a qualitative approach to data collection was thought to be most suitable. The emphasis on using qualitative methods of data collection and analysis is therefore a deliberate part of the research design.

An inductive analytical approach was favoured that focused on the data collected and moved towards forming general conclusions rather than starting with a theoretical claim or hypothesis to test against empirical data (Bryman, 1992; Dingwall & Murphy, 1998). Data collection and analysis were not discrete stages of the research design. Instead this was a cyclical process and often conducted in tandem so as not to impose a pre-defined structure onto the data. Theory was used to provide a general frame of reference and guide the initial collection of data. Preliminary analysis of the data collected was used to inform and refine subsequent data collection and analysis by focusing in on topics of interest, including further exploration of unexpectedly important topics. Methods of data collection analysis are discussed further in the following section.

The case study

As cognitive enhancement is a relatively broad topic, it was necessary to choose a case study to provide a focus for investigation. Case studies involve collecting in-depth, contextual qualitative data for analysis of a phenomenon in its natural setting (Avison, 1997). By carefully scrutinizing the case study, the researcher is in a position to obtain information as to what factors might be operating in that particular situation and how specific problems may be solved.

Modafinil was chosen as a case study because of several distinguishing features; it has received a license for medical use in the UK, it has received significant media

attention over recent years; has been involved in wider political and ethical debates concerning human enhancement technologies; can be used in multiple ways, and is assumed to appeal to a wide range of potential users. Modafinil can therefore be used to investigate the reception and uptake of new neurotechnologies within popular culture, the role and function of medicine in attempts to pharmaceutically control sleep/ alter cognition, once considered a private corporeal form of existence, and the normative implications this might have.

A fundamental limitation with using case studies in social research is the plausibility of generalising results and extending the findings of the investigation to other similar cases. Hammersley (1985) describes three styles of case study research. The first style is where the researcher wants to study typical cases, which are representative of a larger whole. The second is where the researcher uses case studies to test theoretical assertions. The third is where the researcher is not concerned with the case study being representative, the uniqueness of each case is acknowledged and interest lies in the how the workings of particular processes are explained by single cases.

Other studies have successfully adopted a case study approach when investigating the emergence of new pharmaceutical technologies. For example, in a study looking at the role of the pharmaceutical industry in potential medicalisation and disease mongering relating to various conditions, Moynihan et al (2002) used case studies to present a wide variety of controversial material to provoke further debate and research in an understudied area.

In the case of this research, the use of a single case study to explore the wider phenomenon of human cognitive enhancement falls closer to Hammersley's third style of case study research. This means that the results obtained will not be representative of all cognition enhancers. However, it will be possible to gain an understanding of how decisions are made and how these positions are negotiated by stakeholders

across different social contexts and to comment on how social and cultural representations of science and technology can influence the perceived appropriateness and acceptability of the uses of a new technology. According to Morse (1999), in this sense, qualitative research can be considered to be generalisable, not because it can claim to be representative of a wider population but because the sample has been purposefully selected for the contribution it can make toward the emerging theory. She argues that the theory developed is applicable beyond the demographic group or specific case studied because it gives details of the process by which a phenomenon occurs. This can then be applied to similar situations, problems, questions and so on.

There are three main methods of finding out about how people think and act in the social world. Put simply, these are direct observation; asking questions and reading documents (Dingwall, 1997). The use of a case study to explore the research questions required a combination of qualitative methods drawing on both documentary data and interviews with a selection of different stakeholders. Each method of data collection and analysis used will be discussed in the following section.

Data collection and analysis

Empirical data were collected and analysed in two stages using two different techniques- media analysis and semi-structured interviews. The methods were chosen pragmatically for their suitability to best address the specific research questions being addressed in each case. Firstly, media data were collected and analysed to uncover the wider cultural framing of sleep, cognition and modafinil use in contemporary society. Secondly, interview data were obtained to uncover in-depth understandings of, and perspectives relating to, the medical and non-medical uses of modafinil by those outside of professional bioethics. Conducting the media analysis prior to collecting the interview data allowed inferences from the first analysis to be followed up in the second. The results of the media analysis, alongside reading secondary

literature on the topic of cognitive enhancement, provided a framework which was used to both guide the second stage of data collection and to interpret subsequent results.

The analysis of popular and interview accounts of modafinil use enabled the investigation of how expectations of pharmaceutical enhancement are changing social perceptions of normality and of behaviours in need of medical treatment/ lifestyle intervention, and how this influences the acceptability of cognitive enhancement in different social settings at two different levels; the cultural and the individual. The following section will discuss the practical, methodological and ethical issues arising during each stage of data collection and analysis.

Collection of media data

Documents can be studied to understand culture, or the process and array of objects, symbols and meanings that make up a social reality shared by members of society (Altheide, 1999). The UK media were chosen as a site of investigation because the media have been shown to provide a central forum for debates regarding issues relating to science, society, lifestyle, and most importantly, health and illness (Nerlich et al, 2003). It is mainly through the media that the general public becomes aware of scientific advances, new therapies- especially in the UK where direct-to-consumer advertising is not permitted (Williams et al, 2008a)- and the social and ethical issues regarding their use and availability. Because the media operate at this interface between science and society, reporting on scientific advances and technological developments in specific ways, they are likely to play an important role in shaping public perceptions of new technologies and their value and applications (Turney, 1998; Nesbit, 2006).

Access, selection and sampling

There is no standard method of conducting a media analysis. According to Altheide (1999) it is the researcher's interest, perceived relevance plus the retrievable characteristic that produces a research document. When conducting any type of documentary analysis sampling is a salient issue as the decision of which material to focus upon is down to the discretion of the researcher (Kroll-Smith, 2003). The researcher's questions, perspective, and approach are all reflected in how a document is transformed into data. Choosing which sources, publications and time periods to study is an important issue and must be considered carefully as this could act to distort the results.

For the purposes of this study, the focus of interest was on stories appearing in the British media about modafinil from the year the drug was developed (1989) to the present date (December 2006). Newspapers were chosen as data sources as newspaper archives are easily accessible and their textual form makes them primary sources of data. More visually orientated media would be more difficult to analyse using the approach taken in this study (discussed in the next section). It would also have been impossible to compare these data with those collected in the interviews.

A wide sampling frame was used in the first instance to find all UK newspaper coverage of the drug. Nexis[7], an online media database, was searched to locate relevant news articles. News articles published on the web and accessible through the BBC News and Sport online archive were also included in the study as recent research shows that the internet is an important site through which people access current news stories and information about science and health (Fox & Rainie, 2000). Two alternative names for the drug, *modafinil* and *Provigil,* were used as search terms using the OR operator. This search produced a corpus of 203 UK news articles in which the drug was mentioned. Newspaper coverage was plotted by year of

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[7] Formerly called LexisNexis Professional

publication (Figure 1) and the graph analysed for trends in coverage, for example any obvious peaks[8]. Sample size is important; however, the corpus obtained for study was relatively small. In cases where there are a lot more articles available for analysis, the researcher could devise a sampling frame to obtain a particular sub-set of articles to analyse using this approach, for example, by randomly selecting a number of articles from the peak periods of publication. This step was not undertaken in this study.

Figure 1. UK media coverage of modafinil/ Provigil 1989-2006
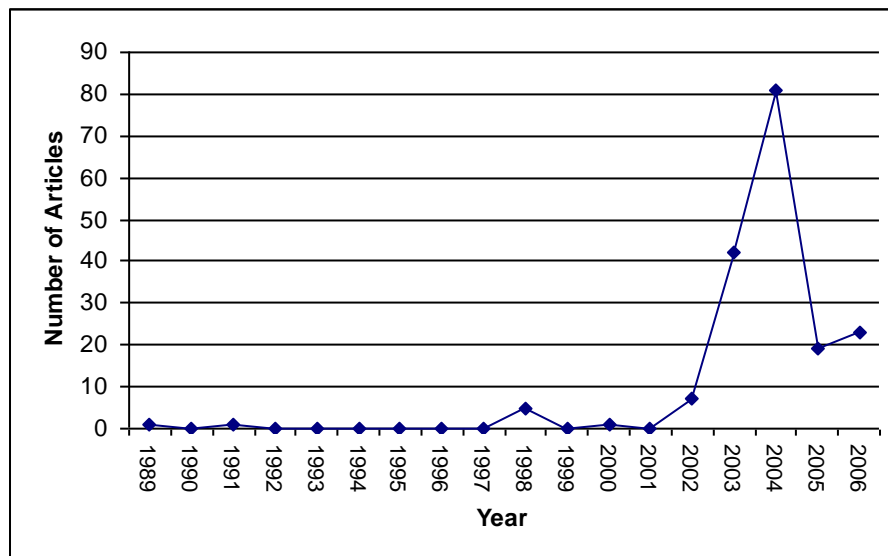
The newspaper and online articles were downloaded in rich text format into Microsoft Word and then subsequently uploaded into the qualitative analysis software tool NVivo. The articles were read and re-read. There was some degree of overlap in the newspaper coverage of modafinil between publications. This was particularly the case when comparing tabloid and broadsheet coverage of modafinil, where there were

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[8] Peaks in publication were found to roughly correspond to specific events:

1998	The UK approval of modafinil for the treatment of narcolepsy
2002	Modafinil UK license extension to cover EDS associated with Obstructive Sleep Apnoea
2003	Athletics scandal as several Olympic athletes test positive for modafinil
2004	Modafinil UK license extension to cover EDS associated with Shift Work Sleep Disorder
2005	Drug Futures 2025? Report published by The Office of Science & Technology
	Exhibition called 'Night Creatures' held at the London Science Museum's Dana Centre
2006	Conference held on "Tomorrow's People" at Oxford University

numerous instances of a shorter version of the same article appearing in the tabloids after a longer article had been published in a broadsheet publication. The decision was taken to focus the study on broadsheet publications and exclude tabloid stories about the drug. This step was also taken for pragmatic reasons, making the corpus size smaller, thus more manageable and adaptable to an in-depth qualitative analysis. At this stage duplicate articles were eliminated as well as articles in which modafinil was not central to the story. The remaining corpus consisted of 53 British newspaper articles and 24 BBC news stories.

Analysis of media data

The aim of this part of the study was to empirically investigate discourses surrounding the new sleep drug, modafinil, in order to examine how modafinil and related drugs are represented in popular culture through the media. Thus, providing access to information on how positive and negative expectations associated with this technological development and associated social and ethical issues are used to frame the uses of cognition enhancers across different social domains. Recent analyses of the social construction of modafinil in the media have contributed to such an understanding (Williams et al., 2008a). However, in order to gain more fine-grained insights into how the media portray the various uses of modafinil and its status in science and society, it was necessary to apply a method that could give access to deeply embedded and sometimes hidden conceptualisations of the phenomena.

Analytical approach

The corpus of media reports were analysed using discourse analytical approaches (DA) (Antaki et al, 2003; Hepburn & Potter, 2003) specifically drawing upon and combining aspects of frame analysis (Entman, 1993; Nerlich, Hamilton & Rowe, 2002) and metaphor analysis (Lakoff & Johnson, 1980; Schmitt, 2005; Kövecses, 2006). Congruent with the philosophical standpoint outlined above, DA approaches focus on

how social realities and identities are constructed through discourse rather than searching for an underlying truth. Language is viewed as a mediating tool that represents the world and discourses are viewed as actively constructed and situated through the choice of language that is used (Titscher et al, 2000).

Discursive frames act to organize thought and package complex information by focusing on certain interpretations over others. Frames organise and impose coherence and can be evoked by the use of images, metaphors, clichés, book titles and other devices (Goffman, 1974; Turney, 1998). In the media, frames are usually derived from shared cultural narratives and myths and resonate with the larger social and cultural themes (Schön & Rein, 1994; Eubanks, 2008). The study of frames is important as they provide journalists and readers with ways to make sense of complex situations by filtering people's perceptions and expectations and providing particular visions of a problem or a solution to a problem (Tannen, 1979).

How problems are framed can be influenced by the use of particular metaphors which, according to Schön (1979), 'generate problem setting and set the direction of problem solving' (1979: 255). Metaphors are much more than rhetorical devices used poetically or as linguistic aids to explanation. They are often underlying framing devices that are used to draw parallels between two seemingly unrelated concepts, transferring their image structure from a familiar or straightforward experience to a novel or complex one (Kövecses, 2006). Metaphor is pervasive in everyday life, shaping both how we think about and understand the world on an epistemological level and how we see and act in the world on an ontological level (Lakoff & Johnson, 1980). They also structure our attitudes about public and scientific issues (Nelkin, 2001). For example, media coverage of medicines and other health products are often framed by 'stock stories' (Seale, 2003) in part generated though metaphor. In such stories the metaphorical systems used to describe illness, disease and the body are important linguistic choices which can reveal deep social anxieties about the control of health and the control of society. According to Lupton (2003: 78), 'representations of the ill body are

inherently political, seeking to categorise and control deviancy, valorise normality and promote medicine as wondrous and ever-progressive.'

The way metaphors are used in the media to draw parallels between seemingly unrelated concepts and to make the novel or unfamiliar appear familiar is therefore an important aspect of analysing media data. Metaphor analysis combined with frame analysis has been used successfully in media studies and STS in recent years to reveal hidden agendas, ideologies and beliefs about emerging technologies, policy controversies and issues of health and illness (Wallis & Nerlich, 2005; Nerlich, Clarke & Dingwall, 2000; Nerlich & Hellsten, 2004; Nerlich et al., 2003; Gwyn, 2002).

Analytical process

In order to investigate how the uses and users of modafinil were portrayed in the UK media, a version of metaphor analysis combined with frame analysis (or metaphorical frame analysis) was used. An iterative analysis process was undertaken, re-reading and coding the corpus of articles and generating themes. Thematically related parts of the embedded analysis in each data source were grouped together. The coding of articles was discussed with BN and PM[9], ensuring a degree of inter-researcher reliability was built into the interpretation of data and enhancing analysis. The articles were first categorised according to their main theme(s). Four main themes emerged, related to four 'discourses' in which modafinil use was discussed; patient discourse (focus on treating a sleep disorder); sports discourse (focus on the use of modafinil by athletes); occupational discourse (focus on military, shift workers, students); recreational discourse (focus on leisure or general use).

During the next stage of analysis articles were read and re-read to isolate sub-themes and central metaphorical concepts in order to reveal emerging frames and their distinctive features (Entman, 1993). This involved the systematic isolation of sections

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[9]Thanks to Brigitte Nerlich and Paul Martin for agreeing to take on this role and all of their help during this stage of data analysis.

of text containing conceptual metaphors from each article. Through discussion between researchers thematically related expressions were then grouped together as 'nodes' in NVivo to enable a detailed study of their linguistic features and implicit value judgements (refining methods proposed by Lakoff & Johnson, 1980; Schmitt, 2005; Kövecses, 2006). The extent to which each metaphorical frame was found in each of the four sleep discourses (these are introduced and discussed fully in Chapter 4) was quantified to gain an overall picture of the way such metaphoric expressions framed the media discourses. Many different types of metaphorical expressions were identified. However, the analysis was focused on the use of the three most prevalent metaphorical frames which were used to varying degrees across the four discourses.

Metaphorical frames were not based solely upon salient metaphors, but around particular and sometimes inconspicuous metaphoric expressions that enabled discourse to be articulated in a specific way. Wider framing devices that were consistent with the central metaphorical concept, such as reference to 'stock characters' (e.g. Frankenstein), reference to standard works of literature (e.g. Brave New World), historical references (e.g. Eugenics) and argumentative clichés (e.g. 'opening Pandora's box' or 'going down a slippery slope'), which provide a short hand link to complex ethical arguments and debates, were also included in the analysis. Each article contained some, but rarely all components of one or more metaphorical frames. The approach used, however, was based upon an analysis of how the metaphorical frames were built up and used to structure discourse across the media sample as a whole rather than in individual articles.

The evaluative orientation of each sleep discourse was determined by counting how often a metaphorical expression was used in a positive or negative way. These data are illustrated in percentage form (Chapter 4). To give numbers in a more formulaic way would be less accurate, as the data do not support this degree of refinement (Bryman, 1988). Therefore, the quantitative data were used as a descriptive tool to guide the analysts gaze, enabling focus to be centred on the most prevalent

metaphors and frames used in the first instance. In the second instance, it enabled the value-orientation of particular frames to be quantified and thus differences between them opened up for deeper qualitative analysis. Importantly, this also allowed the analysis to take into account that all frames and perspectives present in media debates do not carry equal weight or value. This enabled an assessment to be made of the extent to which modafinil use was portrayed as legitimate or illicit in each context of use. Results and analysis of media data are discussed further in Chapter 4.

Qualitative interviewing

In-depth qualitative interviewing is a powerful research tool that can be used to reveal the details of how people think and act in everyday life (Haimes, 2002). It gives the opportunity to explore how the informants themselves define the experiences and practices that are the object of research (Murphy & Dingwall, 2003). Interview data can be treated as giving an authentic insight into people's experiences. According to Silverman (1993), the best way to obtain this type of data is through qualitative open-ended interviews which focus on an informant's own definition of a phenomenon. He argues that this allows a penetration of public accounts and a reorientation of the research to the perspective of the community being researched.

Others argue that no data are ever free of contamination and a researcher may never be sure that what a respondent says in an interview is a true representation of what they really think (Dingwall, 1997; Hammersley & Atkinson, 1983; Murphy & Dingwall, 2003). It must also be remembered that an interview situation is a social encounter that is deliberately created to talk about a specific topic of interest as defined by the researcher. It follows a specific pattern of interaction, usually a turn-taking system where the interviewer proposes topics for discussion and the respondent attempts to provide acceptable answers. Dingwall (1997) has likened interviews to a 'dance of expectations' in which individuals are required to demonstrate their competence in the role in which the interview places them. He explains that:

'I produce my actions in the expectation that you will understand them in a particular way. Your understanding reflects your expectations of what would be a proper action for me in these particular circumstances which, in turn, becomes the basis of your response which, itself, reflects your expectations of how I will respond' (1997, p.38).

As a result, the respondent will attempt to present themselves as a sane, competent and moral member of a particular community (Goffman, 1974). Drawing on the work of Cicourel (1964), Dingwall (1997) describes this is an unavoidable constraint of face-to-face interaction. The consequence of this is that the data produced during interviews are social constructs, created by self-presentation of the respondent and the signs of acceptability from the interviewer that they receive. From this perspective, interview responses are not taken as true or false. Instead interviews are considered to be occasions for giving and receiving accounts of a particular phenomenon that are treated as legitimate in a particular setting and should be treated as displays of perspectives and moral forms (Silverman, 1993; Dingwall, 1997; Hammersley & Atkinson, 1983).

The semi-structured interview

Semi-structured interviews were used in this study rather than open-ended interviews, as the way the different groups talked about specific phenomena was of importance. Using an open-ended interview design may have led to entire topics of significance being omitted. Semi-structured interviews are based upon a pre-compiled interview guide that can allow for the interactive flow of information between the interviewer and interviewee within certain limits (Hannock, 2002). Semi-structured interviews work well when the researcher has already identified specific topics they want to address, as the researcher can decide in advance what to cover while maintaining a degree of flexibility to receive any unexpected information the respondent may offer. This flexible

approach allows interviewees to discuss information that they think is relevant that could have otherwise been neglected (Green et al, 2002). The inclusion of such information is of importance for this research, as the associations different actors make and the contexts they link with cognitive enhancement are necessary in obtaining a complete picture of how modafinil use was understood and positioned in social context. Therefore, this characteristic of the semi-structured interview is an essential part of the research design.

Semi-structured interviews were therefore used as a tool to explore and discover how each group talked about sleep and modafinil use in their own terms, which cultural narratives and frames they appealed to and how they negotiated social and ethical issues that arise from human enhancement technologies in the context of their everyday lives. Large scale opinion questionnaires have been carried out in this area before (Nature, 2009) and could have been devised to collect data from a larger sample. However, qualitative interviewing was selected as the method of inquiry as it would allow the participants to reflect upon modafinil and its prospective uses in depth, providing both a rich description and also an understanding of the significance of events in relation to their own experiences (Biddle, 2003).

Collection of interview data

Mapping the domain of research began with a reading of the neuroethics literature which revealed a broad range of potential stakeholder groups in the development of cognition enhancing pharmaceuticals (Chapter 1). All of these would be likely to have different interests and views on how the drug ought to be used and would be highly informative to study. From the results of the media analysis it was decided that the second stage of data collection would focus on ambiguous spaces the technology occupies and how social, ethical and future orientated discourse is used to construct the technology as medicine, enhancement tool or otherwise in these spaces. It was necessary to limit both the amount and the breadth of material collected to allow for a

complete and comprehensive in-depth analysis of the data to be carried out (Silverman, 1993). Two such spaces were identified, the workplace and university. Therefore, shift-workers and students were selected alongside scientists and clinicians as groups to target for interview (as opposed to patients or athletes for example). Issues of access, selection and sampling will be discussed in relation to each of these three groups in turn before attending to the practical, methodological and ethical considerations impacting on the collection and analysis of interview data more generally.

Scientists and clinicians

Scientists and clinicians who were involved in the study of modafinil and its uses in the two boundary cases or those with 'expert' knowledge in related fields (e.g. neuroscientists, circadian biologists and other sleep researchers) were targeted for interview. Interviews with this stakeholder group aimed to investigate how sleep, cognition and modafinil use were framed by scientific and medical experts. Although this information could have been gathered by examination of the extensive scientific and medical literatures that are available there is much to be gained by carrying out interviews in this area. For example, perspectives that conflict with dominant ideas and theories[10], unrecorded information, new theories, personal opinions and experiences of these individuals could be obtained (De Chadarevian, 1997). The findings of this strand of the research are discussed in Chapter 5.

Access and sampling

Random sampling was not an appropriate or desirable strategy for the selection and recruitment of scientists and clinicians. The aim was to interview individuals with interests and expert knowledge in specific areas of research, not to obtain a large or

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[10] For example, scientists often told me during the interviews that modafinil was probably not as efficacious in 'healthy' populations as it appeared to be in the literature because it was much harder for scientists to get research published that showed a negative finding as opposed to a positive one.

representative sample. The sampling frame that was developed and used had two components. Firstly, media data were used to: extrapolate key voices from the sleep science and medicine communities; identify sleep clinics and research institutes based in the UK; and sleep scientists or clinicians involved in dissemination of sleep research or medicine information via the media. Drawing on these sources, a list of scientists and clinicians with an active interest in sleep, sleep disorders and/ or modafinil was complied and further leads identified to follow up. A benefit of including the online news stories in the first part of the study was the network of links related to each story that was available alongside the main news article. This was used to provide information about key actors in the sleep field. Using the media data in this way (as a component of the sampling frame) meant that some important sources may have been missed. However, this provided access to the organisations and opinions that dominate the public domain.

A second component of the sampling frame involved identifying individuals for interview through their participation at one of the most prominent academic conferences in this area, WorldSleep, which is held every four years and brings together professionals from all around the world who have an interest in sleep science and medicine. Through attendance at the 5-day conference in September 2007 in Cairns, Australia (attended by an estimated 3,000 delegates, making it one of the largest international meetings for sleep medicine), observation of various talks, interaction with delegates and collection of different types of documentary data (e.g. conference notes, paper abstracts, sleep science and medicine journals, flyers, promotional material from pharmaceutical companies), individuals with world-leading expert knowledge in the sleep field were identified. There was also an element of 'snowball' or opportunistic sampling as some of the respondents passed on details of the study to their colleagues or provided details of individuals whom they thought would be interested in taking part in the research.

Interview population

Virtually every lead available was followed up and over 50 individuals/institutions were contacted via email for interview. Of these, 20 individuals replied and expressed their interest to take part in the research[11]. Between July 2007 and June 2008 interviews were arranged and conducted with 15 'sleep experts', eight were male and six female. Interviews were conducted until redundancy in information was reached, at which point further sampling was terminated (Lincoln & Guba, 1985)[12].

Ten respondents were based in UK clinics or research institutions at the time of interview. The remaining five respondents were based in clinics or institutions outside of the UK. These individuals were included in the study due to their world-leading expertise in the area of this research. Scientists and scholars and their knowledge or theory tend to move between institutes and countries and cross-continental collaborations are very common. It was therefore thought desirable to include the accounts of highly influential scholars working outside of the UK in the study to obtain a more rounded and complete picture of current scientific and medical sleep discourses[13].

Respondents were categorized as either 'sleep scientist' or 'sleep clinician' based upon their experience and activities. Overall, the interview population consisted of nine sleep scientists based across three sleep research centres in the UK or at one North American research institute. This group included neuroscientists, geneticists, circadian biologists, clinical psychologists, and psychologists whose primary conduct in the sleep field was academic research of a biological (3), psychological (4) or

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[11] Interviews were not conducted with all of these individuals for various reasons. For example, difficulties in arranging a convenient time for interview or after initial expression of interest the individual failed to respond to further contact.

[12] As discussed previously, data collection and analysis were not discrete stages of the research. Preliminary analysis of the interview data was used to guide and focus the collection of further interview data. After each set of 5 interviews codes were reviewed and compared and the interview guide modified to take account of theoretical leads arising in the data.

[13] The UK/ non-UK distinction was not clear cut. For example, one of the scientists, currently based in North America, had spent most of his career in the UK. Another was working in a North American institute for purposes of collaboration with a European Sleep research centre, and due to return to this European institution after two years.

biopsychosocial (2) nature. Six respondents were categorised as sleep clinicians. These individuals worked in two private UK-based sleep clinics or were based across three different North American sleep clinics. This group included practitioners of medicine (2), clinical psychology (3) and psychotherapy (1) whose work involved the direct assessment and treatment of patients in a clinical setting[14]. Further details of the interview population and how they are identified in the data presented can be found in Appendix III.

Interviewing elites

In an interesting and informative discussion of his own experiences of fieldwork, sociologist, bioethicist and ethnographer Charles Bosk (2001) states that gathering data [as an ethnographer] 'requires a certain skill at playing dumb' (2001: 218). Although interviewing is somewhat different from the all-encompassing immersion into a field experienced by ethnographers, Bosk's account is relevant and recognisable to many qualitative researchers where an element of playing down the extent of one's own prior knowledge of the field is crucial to the research strategy adopted. Prior to interviewing those with expert knowledge in a particular field it is often necessary for the researcher to become familiar with literature, principles, practices, theories and even values and norms operating in a particular sphere in order to delineate which information is relevant and define the focus for their research. This was the case in this research where, by the time of interviewing the majority of respondents, familiarity had been achieved with some of the sleep science and medicine literature, current theories and practices. Areas of contestation had been identified through attendance and observation at a sleep science and medicine conference and other interviews had been conducted. Although a level of competence in the area was displayed, it is doubtful whether the same lengthy and detailed accounts that were given by sleep scientists and clinicians during the interview process would have been solicited had I

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[14] The researcher/ clinician divide was also not clear cut, as most of the clinicians also had an interest in clinical research and teaching with three holding university teaching posts. Three of the respondents classified as 'scientists' did also occasionally see and treat patients.

revealed the full extent of my knowledge prior to the interview. Instead, I assumed the role of student and let the interviewee assume the role of teacher. This proved to be a useful way of 'researching up' and of eliciting full and detailed accounts from the interviewees[15]. It enabled the conversation to flow naturally and for questions probing for more information to be asked without feeling intrusive or inappropriate. Upon reflection, this was more of a natural occurrence at first, roles which both I and the respondents seemed comfortable with rather than a conscious decision[16]. Scientists and clinicians were interviewed at a place of their choosing. This ranged from coffee shops, restaurants and hotel lobbies to university based offices.

Shift workers

Shift workers were targeted for interview with the aim of situating understandings of psychopharmaceutical use in one specific social context in order to further explore the emerging social and ethical issues surrounding the use of modafinil as defined by potential users. As discussed in Chapter 1, several specific occupational roles are repeatedly referred to by bioethicists when discussing the potential use of cognition enhancing substances among the workforce. Typically, these include the drowsy doctor or surgeon on night call; airline pilots on transcontinental flights; air-traffic controllers who have to operate in a high stress environment; long-distance lorry drivers who drive through the night; nurses working long shifts; and ambitious professionals trying to pack more work into a day (e.g. Greely et al, 2008; Sahakian & Morein- Zamir, 2007; Glannon, 2008; Synofzik, 2009; Wolpe, 2002; Farah, 2002). Because of the wide-range and mix of professions and type of person the drug is assumed to appeal to, the decision was made to include shift workers in the study from a range of occupational roles and types of job. Rather than just focusing in on one particular occupational context which could have significantly biased the data

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[15] Several of those interviewed also got in touch with me after the interview to provide copies of papers that were not yet published and which they thought might be relevant to me and to provide details of papers and books that I might find useful.
[16] For example, the first interview conducted was with a Professor over coffee in his university based office and I had already identified myself as a postgraduate research student.

collected, it was hoped that this type of sample could offer more general and varied data.

Access and sampling

The decision to recruit respondents across professional boundaries did impose constraints on the research. In relation to access to research participants, a common or organised space was not identified where people who work shifts, regardless of their profession or occupational role, gather to form a collective identity as 'shift workers'. Therefore, the decision was taken to create such a space specifically to recruit shift workers to take part in the study. A virtual space was set up online via a social networking website with the group name 'UK Shift Workers' which was used to invite people who were resident in the UK and currently working shifts to take part in a short interview. Information about what to expect during the interview was also included on the website. Details of the group were advertised via the 'newsfeed' and 'groups' section of the website and sent out to personal contacts known to work shifts. A form of snowball sampling was also implemented. The message on the webpage urged others to pass on the group details or my contact details to anyone they thought might be interested in taking part in the study. The group was left open for 3 weeks during October 2008 in which time it accumulated 20 members.

The internet is increasingly becoming a site where social research takes place. Large scale online surveys are relatively common and many qualitative methods have been transferred to the Internet, for example, there are forms of online and email interviewing, participant observation and virtual ethnography (Murthy, 2008). It has been argued that using the Internet as a tool enables the researcher to reach people and groups of people who would have otherwise been difficult or impossible to reach (Flick, 2009).

The creation of an artificial research group such as the one described above has both advantages and limitations. Individuals who joined the group did this on a voluntary basis and self-identified as shift workers. The consequence of this was that they were interviewed on a personal level as a member of the group rather than as a member of their professional organisation. The main benefit of this was that it allowed individuals from different professions living in any area of the UK to be included in the study and accessed with relative ease. Other benefits were the efficiency (in terms of time and research costs) and interactivity afforded to the recruitment process. The virtual nature of the group meant that participants could express their interest in the study immediately by clicking on a tab to join the group. Anyone that was interested or had further questions could contact the researcher informally through the website without giving their personal contact details. The group was also free to set up and enabled details of the study to be advertised to any shift worker in any profession nationwide relatively quickly at no cost.

A major disadvantage that can be applied to Internet research in general is that those without access to the technology are excluded from the study in the first instance (Murthy, 2008). Specifically in this case, the consequences of using a particular social networking site meant that only those who were already members of that particular site were able to be reached during the initial stages of recruitment. However, the snowball element to the sampling strategy went some way to remedying this, as members of the site and the group were encouraged to pass on the contact details to anyone they thought might be interested in taking part. In three cases individuals that joined the group did so on behalf of a friend or family member and acted as a go-between passing on contact details between parties. Two other disadvantages of recruiting participants online that have been identified are the lack of personal or demographic information that is available to the researcher (often only an email address or screen name is made available) and how the demographic information given by participants can be verified. Not having complete information about a participant can lead to difficulties in evaluating whether the individual is who they say

they are (Flick, 2009). However, the partial demographic profile of potential participants was not considered to be problematic in this study as further relevant details could be gathered and others verified if necessary during the interview process.

Interview population

All 20 individuals who joined the group were contacted separately and invited to take part in an interview. Some members of the group did not respond to the request[17]. Individuals were contacted and interviews were conducted until the available leads were exhausted (Lincoln & Guba, 1985). In total, 11 shift workers were interviewed for the study. Respondents ranged in age from 21 to 53. Seven identified as male and four as female[18]. As evidenced in the eventual interview population, the label of 'shift worker' does not refer to a homogenous group of individuals nor working patterns. The shifts these individuals worked varied from full time night shift to part time rotating day shift work. The length of time each person had worked shifts also varied from just 7 months to over 11 years.

One respondent was a permanent night shift worker in an airport. Six respondents were rotating shift workers. Four of these individuals were hospital-based medical professionals: two doctors, two nurses. One respondent was a police officer and another worked as a telephone operative in a call centre. One respondent worked on a part-time basis in two different jobs and had done so for two years. Her main job was in mental health care and her second job was in a shop as a retail assistant. The final three respondents in this group were a retail staff trainer, a machine operator in a factory and a postal worker who all worked fixed early shifts[19]. On aggregate, the

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[17] I have termed these 'silent members'- individuals who join causes or groups online to show their support but do not play an active role in contributing to the group agenda or activities.

[18] The relatively low number of shift workers interviewed was not considered problematic as there was some overlap between the shift worker group and student group. Three of the students interviewed also worked shifts and one of the shift workers was also a student. Data from each of these respondents was therefore included in the analysis of both shift workers and students discourse where appropriate.

[19] Further details of each of the respondents and how they are identified in the text can be found in the appendices.

working hours of those interviewed spanned the full twenty-four hours of the day, seven days a week at all times of the year.

Interview strategy

When interviewing shift workers the research strategy discussed above of 'playing dumb' (Bosk, 2001) was also somewhat appropriate. By this stage of the field work a great deal of knowledge and familiarity with medical and scientific discourse about shift work and its effects on sleep, cognition and lifestyle had been accumulated. 'Playing dumb' was then a useful strategy to adopt to avoid making assumptions, being prescriptive or imposing scientific or medical discourse onto the data. Respondents were interviewed in their own homes or a place of their choosing. Interviews were informal and conversational with the interviewee given the freedom to describe their experiences and opinions in their own terms using their own words[20].

Students

In both the neuroethics and media discourses analysed, university students were depicted as existing users (and imagined as future users) of cognition enhancing drugs for distinctly non-medical purposes, to enable them to study longer, perform all-night study sessions, boost alertness in lectures, and improve exam grades (Nature, 2009). Claims are frequently made that an ever-increasing percentage of students are obtaining neuropharmaceuticals either illegally or by false diagnosis and using these substances to improve their academic performance (Volkow & Swanson, 2007; Chan & Harris, 2006; Greely *et al,* 2008; Farah, 2004; Schermer et al, 2009; Forlini & Racine, 2009). Students were interviewed with the aim of situating the pharmaceutical augmentation of cognition by this group of prospective users in social context. The way in which students talked about and understood modafinil use in relation to their

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[20]I wore casual clothes and identified myself as a student- one without a job- curious to find out about the world they work in.

everyday lives as university students was analysed (Chapter 7) to explore the different ways in which modafinil use can be configured in social context and how this influences its perceived acceptability in this social domain.

Access and sampling

This research was conducted at the University of Nottingham. For pragmatic reasons (e.g. cost, efficiency and ease of access) the students interviewed for the study were recruited from the University of Nottingham undergraduate population. An email advertising for undergraduate students to participate in the study was sent out to undergraduate students via the University's internal email system[21]. In October 2008, over 1000 undergraduate students were randomly selected and invited to take part in an interview. The email contained information about the study, what to expect during the interview and asked respondents to specify a preferred time for interview chosen from a selection of time slots offered by the researcher[22]. As interviews were scheduled to take place in the last two weeks of term when many deadlines were looming, students were informed that they would be compensated for their time as an extra incentive to participate[23].Eighty students replied to the initial email and expressed their interest in taking part in the study. Around three quarters of the students who replied to the initial email were female. Forty of these students were chosen at random and contacted with a date and time for interview. Fourteen students actually turned up at the specified time and place and were interviewed. The hit rate was therefore much lower for this group than in either of the other two stakeholder groups interviewed.

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[21] The email system allowed emails to be sent to all students in a particular year group who were registered for each course in a school. There are hundreds of courses run by each school and over 60 schools across 5 faculties. For this reason, 30 schools were chosen to contact at random, and emails sent to students who were registered for the most popular course run by that school.
[22] A copy of the email sent to students can be found in appendix II.
[23] Students were given a £5 gift voucher.

Interview population

Fourteen students from seven schools across four faculties were interviewed for the study. Nine of the respondents were in their first year of study, one was a second year undergraduate student and the remaining four were in their third year of study. Ten of the students interviewed were female and four were male. Although gender is not a primary concern in this study, the gender bias is worth noting as it could potentially influence and act to distort the results. Although coming from a variety of disciplinary backgrounds, the students interviewed are not representative of the student population at the University of Nottingham as a whole nor the wider student population in the UK more generally. Therefore, the data collected is not considered to be broadly generalisable to other student groups.

Interview strategy

When interviewing students, it was not so easy to 'play dumb' to solicit information. In fact, this group were the most difficult to interview and required the most prompts and encouragement to expand upon their answers. All interviews were conducted at the University of Nottingham, either in my office or one of the seminar rooms in the Department of Sociology and Social Policy. I identified myself as 'fellow student' and wore casual clothes to put interviewees at ease. In retrospect, it was perhaps for these reasons that students did not provide detailed descriptions of their views and activities without much prompting. Perhaps, they felt that I already knew where they were coming from, being 'one of them'. Or perhaps it was because they were the group furthest from the technological innovation, in the sense that most of them could not see any use for the technology in their lives. Analysis of the data collection from student interviews is discussed in Chapter 7. The next section of this chapter discusses the methodological and ethical considerations arising during the interview process more generally and details how they were addressed in this study.

The interview process

As described above, virtually every lead available was followed up and interviews conducted until redundancy of information was reached or leads were exhausted (Lincoln & Gruba, 1985). I travelled up to five hours each way to conduct face-to-face interviews, where possible (n=33). In the case of shift workers most interviews were conducted on Sundays or in the evenings when the individual was not at work. Where face-to-face interviews were not possible, due to the availability or preference of the respondent and the large geographical area covered, interviews were carried out via the telephone (n=7). This was the case for two clinicians and one sleep scientist, who indicated they would prefer a telephone appointment, and for four of the shift workers who worked nights and did not live in the locality of the researcher. They were each telephoned at a time that they specified as suitable to them[24]. Interviews lasted between 3 hours and 20 minutes, with an average of around an hour. All respondents consented to their interviews being recorded using a digital voice recorder. The first couple of interviews with members of each stakeholder group tended to be the longest and more exploratory in nature. Overall, interviews were on average longest with the scientists and clinicians, who were used to talking about sleep and most familiar with modafinil, and shortest in the student group.

Telephone interviews

Several limitations have been identified with using telephone rather than face-to-face techniques for interviewing. Some argue that conducting an interview over the telephone can make it difficult for the researcher to build a rapport with the respondent, that it could cause interactional problems when addressing sensitive issues (for example trouble in assessing the reaction of those being interviewed to the topics raised in the absence of non-verbal cues and expressions) and may lead to the premature ending of the interaction (Opdenakker, 2006). Despite this, many

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[24] Telephone interviews were conducted between 8am and 10pm.

researchers have successfully used this technique in a variety of studies investigating a wide range of issues (e.g. McDonald et al, 2010; Thomas et al, 2004; Adams et al, 2006).

Respondents were only interviewed over the telephone if they identified this as more desirable to them than taking part in a face-to-face interview. Telephone interviews did tend to be shorter on average than face-to-face interviews but there was no noticeable lack of rapport compared to face-to-face interviews. The main benefit of using telephone interviews for this study was that people from all areas of the UK could be reached and interviewed at no extra cost to the project.

The interview guide

Interviews were conducted using a semi-structured topic guide which encouraged respondents to narrate their own accounts and focus on those areas of importance or interest to them (Murphy & Dingwall, 2003; Silverman, 1993). The use of an interview guide allowed the interviewer to elicit the respondents' own understandings of the phenomenon in question while still addressing topics identified beforehand as being of interest to the study and providing direction for the study to follow (Hannock, 2002). The interview guide was developed prior to data collection informed by reading the neuroethics and scientific literatures and by the results of the media analysis. It was refined and adapted throughout the data collection process. It consisted of four broad headings which related to themes to be covered and a series of prompt questions which may or may not have been asked depending upon the answers already given. These main themes carried across each of the stakeholder groups interviewed but wording differed slightly between each group as appropriate[25].

Firstly, respondents were asked to provide some background information about themselves and their lifestyle (addressing issues of education, employment, recreation

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[25] A sample interview guide can be found in the appendix IV.

and so on). This section of the interview also acted as a way to put the interviewee at ease and for rapport building. Secondly, they were asked some general questions about sleep and health (sleeping patterns, perceived relationship between sleep and health etc.). The third section of the interview focused on modafinil and its potential uses (exploring medical/ non-medical uses of the drug in different user groups)[26]. In the final section of the interview the respondent was asked about their personal views and opinions (specifically in relation to the perceived social impact cognition enhancing drugs could have on society, whom they thought modafinil should be available to now and in the future and who they thought the drug would be used by). Directive questioning was used in the later stages of the interview to ensure that all areas were covered and to follow up on theoretical leads from both previous interviews and the literature[27].The interview ended with an opportunity for the respondent to add any additional information or comment.

Analysis of interview data

The methods literature indicates many ways in which interview data can be analysed (Coffey & Atkinson, 1996). Some researchers consider interview data to reveal what people treat as self-evident (or the 'right' thing say) and use this data to find the cultural and moral discourse surrounding a particular topic (Green et al, 2002; Silverman, 1997). The use of interview data in this way is relevant to the aims of this study; however it will be necessary to bear in mind that although it may yield important information, interview data must be treated as socially and contextually constrained (Dingwall & Murphy, 2003). As discussed above, interview data must be recognised as accounts of people's actions, feelings and opinions and how these are shaped by social context,

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[26] In some cases respondents expressed concern that they might not be knowledgeable enough about modafinil to be helpful. This was true of respondents from all groups, including sleep scientists.
[27] Some respondents began by repeating 'official' biomedical discourses when asked to talk about sleep and health. For example, one respondent (a sleep scientist) simply recounted the presentation he had given of his work at the conference the day before. Questions that were designed to probe beyond this type of data were asked in the later stages of the interview which encouraged accounts that were more personal and emotional.

including the interview context itself (Hammersley & Atkinson, 1983). How questions are asked and information presented to respondents during an interview by the interviewer can therefore influence the type of answers elicited as respondents attempt to provide acceptable answers and demonstrate their competence as a sane and moral member of their community (Goffman, 1974; Dingwall, 1997; Dingwall & Murphy, 2003). This is especially relevant to consider when discussing concepts and technologies that the respondent may not be familiar with or used to talking about before the interview. When analysing interview data of this sort it is therefore important to take into account that there are not always stable meanings attached to an event or experience, that people can hold conflicting sentiments at any one time (Dingwall & Murphy, 2003). Therefore, the opinions expressed during an interview may, in a sense, reflect the questions that were asked by the interviewer, the information that was given to the respondent and how this was framed.

Taking this into account, details about modafinil were given to respondents in an attempt to accurately reflect information about modafinil that is currently available in the public domain rather than the interviewers own opinions on the subject. This included a description of its current status as a prescription drug used to treat sleep disorders, a summary of its potential cognition enhancing effects and an outline of recorded adverse effects. A typical example of how this information was given to respondents, how they were asked to imagine uses for the drug and potential future impacts, and how they responded to this is illustrated in the interview extract below:

Interviewer: Have you ever heard of the wake promoting drug Modafinil?

S1, Mike: Nope.

Interviewer: Well, it is a wake promoting drug that is used to treat sleep disorders such as Narcolepsy - you know the one where people fall asleep all the time?

S1, Mike: Yeah.

Interviewer: And it has been tested by the military and also different groups of scientists since about 1991 and it has been found that it can keep healthy people awake for up to 72 hours. It also is said to have these other cognition enhancing properties such as making people think clearer, concentrate better, improving memory, problem solving and planning skills and things like that. The kind of adverse effects - it is marketed as a safe drug, but there are obviously problems, like some people with hypertension it might increase their heart rate so not be good for them, it has been linked to severe headaches in some people and severe skin rashes, but overall it is generally known to be quite safe. Do you think that this type of tablet should be kind of available to everybody, sold in the Supermarkets like caffeine tablets or be a medicine prescribed by doctors?

S1, Mike: That's a good question. I think it would have to be prescribed because you would then have probably people abusing it to stay awake for longer - or trying to exceed the dose to stay awake for longer than 72 hours. I would have to see the research to actually sort of have an informed opinion about it I think.

Interviewer: So thinking quite generally then - what impacts could the widespread availability of these kind of drugs have on society do you think?

S1, Mike: Positively if you took say a medical sense, you could have doctors making less mistakes due to tiredness. Potentially you could reduce work place accidents with people being more alert and that sort of thing. I suppose there are possible negative effects if people become dependent on it to be able to actually function properly, in which case I think it is going to be like any other sort of drug addiction, in which case you will have to be weaned off it and that sort of thing. I think possibly if you were of an addictive personality as well, you might get hooked on it and even if it isn't physically meaning they can't function - it might be psychosomatic that they feel they have to have it to function properly - so I suppose that's a possible negative effect of it as well.

Interviewer: And do you think it would be something that would appeal to a lot

of students then, this kind of -?

S1: Mike: I would imagine it would probably appeal to quite few people

definitely. I don't know if I would like to say majority or not, but I can imagine

quite a few people probably would take it, especially during exam times and at

the end of - sort of lot of the third years we have got a big project and probably

taking towards the end of that to be able to get it all done and get all sorted in

time.

Interview data of this sort can therefore be used to explore and to uncover the cultural

resources, norms and values that are drawn upon in order to evaluate the

acceptability of new and emerging technologies. The analysis of this type of data

should then, also be sensitive to the interactional and political contexts in which the

data was generated (Murphy & Dingwall, 2003).

Transcription, coding and interpretation of interview data

The first stage of data analysis was the transcription of data from verbal into written

form. At this stage choices were made about the level of detail to include and the data

was 'cleaned' to an extent. The first two interviews of each set were transcribed by the

researcher in order to gain a greater familiarity with the data. The remaining interviews

were transcribed by a professional transcriber. Upon receipt of the transcripts the

recorded interviews were listened to and the transcripts checked for accuracy.

The results of the media analysis were used to develop a coding frame for the

interview data in the first instance. After carefully reading and re-reading the interview

transcripts with the results of the media analysis in mind, it became apparent that the

metaphorical frames that were most prevalent and structured media discourses about

modafinil were largely absent in the talk of those interviewed. In fact, although

metaphors were present in various forms in the talk of those interviewed, they were

not used as dominant framing devices as was the case in the media data. The

decision was made at this stage to analyse interview data using a similar approach to that used to analyse media data (based on discourse analytic techniques and drawing upon elements of frame analysis) to ensure that the data was analyzed in a systematic and coherent fashion, but without the central focus on metaphors. Instead the analytical framework was developed based on concepts drawn from the medical sociology and STS literatures on medical/ non-medical uses of technology and how prospective uses and users were imagined by the respondents (Chapter 2). Interview transcripts were uploaded into NVivo for coding. As with the first stages of the media analysis, the analytical approach taken to analyse the interview data used a DA approach (Antaki et al, 2003; Hepburn & Potter, 2003) which drew heavily on grounded theory (Glasner and Strauss, 1967; Strauss and Cobin, 1990; Charmaz, 2003). Grounded theory approaches are based on the premise that:

'…the best theory is developed from close engagement with the data. It involves an elaborate process of coding, or identifying recurrent patterns, relationships, or processes found in the data, and the generation of conceptual categories and their properties from the evidence using the constant comparative method' (Beeson & Doksum, 2001: 162).

The quantitative approach used to guide the qualitative analysis of media data was not appropriate for the interview data. Looking for phrases or words used most would not allow access to revealing common themes and ideas that were expressed in different ways or to contrasting or unique cases. A more qualitative, but nontheless systematic, approach to coding and uncovering themes was thought more appropriate. The interview data were analyzed using NVivo to systematically sort and code each section of data (Charmaz, 2003; Bryman, 2001). Topics were indexed, collated and cross-referenced in order to organise emerging themes (Coffey & Atkinson, 1996; Dingwall & Murphy, 1998; Morse, 1994). The inclusion of negative cases or data that do not fit any category is also crucial to grounded theory approaches (Strauss &

Cobin, 1990). The systematic and consistent categorisation of themes and codes in the data is one way to achieve reliability (Kirk & Miller, 1986).

Emerging themes were named, data included in each of the themes were re-read, refined and the specific details of each theme organised to ensure that themes were internally coherent and distinct from one another (Braun & Clarke, 2006). The interview populations were not large or representative samples. It was therefore not appropriate to use any type of statistical analysis. Instead, interpretation of the data began with the establishment of ordered relationships between codes and theoretical concepts (Coffey & Atkinson, 1996). The analysis of interview data is presented in Chapters 5-7.

Ethical issues

A University of Nottingham Research Ethics Review was successfully completed for this project in 2007. The research was designed with reference to the ethical guidelines published by the British Sociological Association (2002) and as such relevant ethical issues were adhered to in the conduct of empirical work. These are outlined below.

Data collection and storage: Interview data were collected via face to face interviews and telephone interviews. Interviews were recorded using a digital voice recorder with the permission of those interviewed and data are securely stored both physically and electronically in locked files. In accordance with current research code of conduct guidelines data will be held for 7 years before being destroyed.

Informed consent: Informed consent is a problematic notion. The amount of information that is disclosed to participants has to be weighed up carefully to make sure that respondents are informed of the purpose of their participation in the research, what is required of them and how the information they provide might be

used, but without soliciting particular responses. Information about the study, including some basic background material, ethical considerations and what their participation would involve was provided in both the initial recruitment email and outlined verbally before each interview took place. Participants were encouraged to contact the researcher if anything was unclear to them or if they required further information about the study. They were also informed of the intended use of the data collected (i.e. quotations to be taken from their answers and reproduced in this thesis, oral presentations and any subsequent papers derived from this thesis). Verbal consent was obtained prior to conducting the interview and respondents were also asked for their permission for their interview to be recorded.

Anonymity, confidentiality and privacy: Participants were ensured that their responses would be kept confidential and their identities private. Any potential identifying information was removed from the data prior to use and all names and places were anonymised. Respondents were assigned pseudonyms and referred to by reference to their occupational role in general terms (i.e. sleep scientist, nurse, student etc). Gender was also assigned randomly to each participant. These categorizations serve the purpose of protecting the anonymity of research participants.

Right to withdraw and ownership: Participants were informed of their right to withdraw from the study at any time and informed that upon this request their interview data would be destroyed. They were informed of their right to request a full transcript of the interview following transcription and their right to retract any part of it prior to the data being used. Several participants did request and were sent a full transcript of their interview. No information was retracted and to date, no participants have withdrawn from the study. There were two incidences where during the interview, the respondent requested that the recorder was switched off and that their disclosures about a specific topic were not included in the study. Their wishes have been respected and those parts of the interviews were not included in the present study. However, the extent to which any comment is really ever completely off-the-record is

debatable. It undoubtedly contributes towards the researcher's understandings and evaluation of events discussed and also could influence the ways in which similar data are interpreted and understood.

Limitations and implications of research design

A general pitfall when dealing with media data is the issue that it is impossible to know who is reading or accessing media information. Because a message has been printed or published in newspapers or on the Internet does not necessarily mean it has been widely disseminated in society as a whole. Some forms of media analysis take a more quantitative approach than the one used this in study. Quantitative media analysis is based upon assumptions of a passive audience; therefore the study of the frequency and pattern of messages is equated to the audience's perceptions (Altheide, 1999). Although this research does take the frequency and pattern of media coverage into account, this information was used as part of the sampling frame (Kroll-Smith, 2003). A more in-depth analysis of the material was also conducted to take account of the audience as 'active' and able to interpret messages within different frameworks. Of interest in this study were the messages, behavioural directives and bodily narratives that were being made available in the media rather than how this information was received or understood by an audience.

As with all qualitative studies, issues of validity and reliability arise when conducting a media analysis in the way outlined above. Relevant questions here include the extent to which the data collected are representative, whether other unreported data sources might contradict the findings and the extent to which the findings reflect the interests of the researcher. Although all qualitative research essentially involves a high degree of flexibility and choice in the direction of analysis on the part of the researcher, attempts were made in the present study to go some way towards addressing these issues. A stringent sampling frame was devised and a quantitative element to the study incorporated to aid in the selection and filtering of relevant data sources. Additionally,

the coding frames used were developed independently and tested through discussions between three researchers to identify potential areas of ambiguity, errors and inconsistency. However, it is acknowledged that despite the analysis being empirically grounded and systematic, the conclusions derived from this type of study of a small corpus of media reports will certainly not be incontrovertible scientific truths; alternative accounts and readings of this body of data are possible.

The main implications of the sampling strategies adopted to recruit people to take part in interviews and the focus on qualitative methods of data collection and analysis are that the interview populations are not large or representative. Therefore, it would be inappropriate to make statistical generalisations from the data. Instead, the study aims to investigate competing narratives that are present, understand a range of concerns, compare groups, illuminate general patterns and processes and to identify key elements of social contexts that are linked to particular responses to the uses of cognition enhancing drugs. Adopting the analytical approach taken does involve researcher bias regarding what themes to focus on and to interpret how they relate to one another so it cannot claim to be objective. However, the knowledge of the processes by which people understood, positioned and negotiated the use of modafinil will, in a sense, be broadly generalisable to other similar cases (Morse, 1999).

In an attempt to demonstrate reliability and validity of the analysis, data extracts are included in the reporting of findings enabling the reader to determine that the claims being made are present in the data. Care has been taken in the research report to present data that are representative of the data collected as a whole rather than a reliance on extreme cases which could be used to back up preconceived ideas (Silverman, 2000; Charmaz, 2003).

Summary

The in-depth analysis of the language used to describe and the conceptual metaphors employed to articulate the multiple uses of modafinil revealed three central metaphorical frames that were each built up around a central metaphorical concept framing the use of modafinil within a culturally available narrative. This analysis provided an understanding of how a single medical technology can be understood in different ways and through the use of different metaphors and their entailments and the normative impacts this might have. This type of analysis can be useful for the in-depth qualitative analysis of small samples of textual data. The value of this approach lies in the rich and detailed descriptions of phenomena it can uncover. In analysing the conceptual structure underpinning discourse surrounding a phenomenon it is possible to map a societal conversation about one aspect of science. One can go some way to providing an explanation as to *why* the phenomenon in question may be understood differently in different domains of social life and *how* this has come about. Results of the media analysis are presented and discussed further in Chapter 4.

Interviews were conducted with forty individuals belonging to three stakeholder groups: scientists and clinicians, shift workers and students. The semi-structured interview was chosen as a research tool because it enabled focus to centre on specific topics of interest that had already been identified while maintaining a degree of flexibility and allowing for an interactive flow of information between interviewer and interviewee (Green et al, 2002; Hannock, 2002). The sampling strategies used to select and recruit individuals to take part in the study varied between each stakeholder group. Where scientists and clinicians were purposefully targeted due to their expertise in a particular area, students were contacted at random to take part in the study. For shift workers, the sampling strategy was again different due to access difficulties. Therefore, a virtual space was artificially created specifically for recruiting these individuals to take part in the study. It has been argued that using the Internet as a tool enables the researcher to reach people and groups of people who would have

otherwise been difficult or impossible to reach (Flick, 2009). In the case of this

research it was particularly useful in enabling access to a hard to reach group without

a collective identity. Interview data is presented in Chapters 5-7.

Chapter 4: Modafinil in the media: metaphors, medicalisation & human enhancement

<u>**Introduction**</u>

This chapter focuses on newspaper articles to explore discourses surrounding the new sleep drug, modafinil. The mass media have been shown to provide a central forum for debates regarding issues relating to science, society, lifestyle, and most importantly, health and illness (Nerlich et al, 2003). It is mainly through the mass media that the general public becomes aware of scientific advances, new therapies-especially in the UK where direct-to-consumer advertising is not permitted (Williams et al., 2008a)- and the social and ethical issues regarding their use and availability. Because the mass media operate at this interface between science and society, reporting on scientific advances and technological developments in specific ways, they are likely to play an important role in shaping public perceptions of new technologies and their value and applications (Nelkin, 2001; Nisbet, 2007; Nisbet et al., 2002).

Previous work has examined the social construction of modafinil in the British print media using a thematic and interpretative analysis to reveal how modafinil is constructed in terms of its various 'uses and abuses' (Williams et al., 2008a). In applying metaphor analysis combined with frame analysis to this area, this chapter aims to go beyond previous research to empirically investigate the discursive construction of these 'uses and abuses' in the media.

Metaphors used in the communication of scientific and technical information can connect public, scientific and policy discourses, facilitate understandings and acting to create common ground for transporting meaning across the 'boundary' of science and society (Nerlich, Hamilton & Rowe 2002; Massen & Weingart, 2000). According to Nerlich et al. (2002), metaphors can act to directly shape public policy by tapping into cultural imagination and through the reinforcement of cultural stereotypes (discussed

more fully in Chapter 3). The analysis presented in this chapter focuses on the metaphorical frames used in media discourses and the conceptual links they create between sleep and health, and the body and technology.

Sleep is a corporeal state, a lived and embodied experience (Meadows, 2005). An analysis of modafinil, a technology that can be used to correct, alter or interfere with the functioning of the body must also consider cultural representations and conceptualisations of the body it is being taken into. In their analysis of newspaper coverage of modafinil in the military, Williams et al (2008a) briefly discuss concerns raised in media discourse over how understandings of the body may be reconfigured through modafinil use. The following discussion pays more attention to this point, giving the framing of the body a greater role in the analysis and arguing that understanding the kind of bodies technology is working on or taken into plays an important role in elucidating how the technology in question is itself understood (Thacker, 2002). In this context it is important to understand what type of 'bodies' are implied by the various discourses around modafinil.

Using metaphorical frame analysis as an analytical tool, this chapter explores under what circumstances modafinil is constructed as a necessary medical treatment or a (il)legitimate performance enhancement and, how in this process, various images of the body are (re)constructed. This will enable an assessment of the extent sleep is conceptualised in medical terms in different domains, the normative assumptions that are embedded in discourse on modafinil and to comment on the relationship between medicine, enhancement and cultural understandings of the body. Specific research questions addressed include: How are sleep, cognition and the body conceptualised in different social contexts? How are uses of modafinil discursively constructed in the British print media? What role is given to medical authority in deciding if particular uses are acceptable? To what extent do media discourses surrounding modafinil use go 'beyond medicalisation'? What does this tell us more generally about cultural attitudes towards human enhancement?

Metaphors and frames

As outlined in chapter 3, media reports on modafinil were categorised into four domains of discourse: patient, sports, occupational, and recreational. This section describes the three distinct metaphorical frames that were used to structure media discourse on modafinil and analyse how they enable the body, corporeal states and the use of drugs to be constructed in specific ways. It shows how metaphorical frames are built up around a central metaphorical concept that frames the use of modafinil within a culturally available narrative. Metaphorical frames are not based solely upon salient metaphors, but around particular and sometimes inconspicuous metaphoric expressions that enable discourse on pharmaceutical use to be articulated in a specific way. Each article contained some, but rarely all components of one or more metaphorical frames. The analytical approach used, however, is based upon an analysis of how the metaphorical frames are built up and used to structure discourse across the media sample as a whole rather than in individual articles (refer to Chapter 3 for more detail on the analytical process). In the next section, how the metaphorical frames were differentially employed in each of the four sleep discourses will be analysed.

War frames: fighting sleep

The war frame was based around the use of military metaphors that constructed the 'body as a battleground' in which modafinil was launched to 'combat' 'attacks' of sleep. An analysis of the components of the war frame revealed that four concepts of war were drawn upon by the media: that of an enemy or injustice; the strategic war plan and events of the battle; personification of victims and heroes; and purpose or desirable outcome. Sleep was described as a 'killer', a dangerous 'enemy' that could 'attack' or 'strike' at any time. People with sleep problems were portrayed as the 'victims' of this metaphorical war, living through a constant 'battle' struggling to 'fight' off 'sleep attacks'. Modafinil was framed in heroic terms being constructed as

something that could be 'launched' to both 'combat' sleep and also as a type of armour that could prevent further 'attacks'. Through this framing the story ends with modafinil giving those with sleep problems control back over their body, in a sense to win the battle and achieve victory over their illness.

Military metaphors used in this way allowed excessive sleepiness to be framed as dangerous, and in the majority of cases, modafinil was constructed as a safe and effective treatment for this condition. By enabling individuals to stay awake during the day and sleep at night, pharmaceutical use was represented as restoring normal sleep patterns and thus providing the means through which one could lead a normal life. War frames are popular in many discourses on health and disease. They provide a strong focus and a moral imperative to use the means available to 'help' the individuals in question. The war frame allowed for medical and non-medical uses of modafinil to be demarcated through the concept of 'abnormality in functioning'. In discourse structured through this frame, the diseased, injured or abnormal body was transformed, via the act of taking modafinil, into a 'normal' body. Modafinil use was constructed as a positive action to restore impaired bodily functions, whether they arose as result of biological lesions or social factors. In both cases, medicine was given authority over the sleep– wake cycle.

When modafinil was perceived to be entering a 'normal' body in which there was no battle to be fought (i.e. in individuals without sleep problems), its usage was framed as a type of 'enhancement' falling outside the remit of medicine. In such instances, war frames were used to argue against the use of pharmaceuticals to 'fight' sleepiness. Individuals taking modafinil outside of medical authority became the villains of the piece, abusing this medicine for 'lifestyle' purposes. Concerned 'scientists', the new heroes, were used to voice fears of the dangers posed by unmonitored or uncontrolled use of this medical technology that might find its way into the wrong hands and the 'wrong' bodies.

The data extract presented below provides an example of how the war frame was typically used in media reports. In a story detailing the daily life of an individual with narcolepsy the journalist writes:

> 'Those who suffer from narcolepsy are doomed to lose the fight to keep their eyes open, and the battle is lost more rapidly if they are already tired or bored'. (*The Times,* 8th September 2003)

Here the use of war metaphors conveys a sense of how serious sleepiness is, and how hopeless the fight to stay awake for those with narcolepsy can be. The way a problem is framed often includes what range of solutions is seen as possible (Conrad, 2001). In this case, war metaphors were typically used to frame sleep in such a way as to make pharmaceutical intervention seem a desirable and necessary solution to the problem of sleepiness. Using modafinil was depicted as a way to win the 'battle' against sleepiness, thus, enabling the user to 'seize the daytime' (*The Times*, 27th July 2004).

Commodity frames: trading sleep

The commodity frame was built up around mechanical and economic metaphors to include several aspects of a 'commodity': that it has a physical presence; can be renewed, replenished, diminished or depleted; and has an extrinsic value, so may be bought or sold. Within this frame the body was constructed as a machine, a set of parts, workings and systems. As illustrated in the data extract below, sleep was often framed as a 'fuel source' required for 'powering' ones metaphorical engines. Individuals were described as needing to 'fill up' their bodies with enough sleep in order for them to remain 'productive' and 'efficient' and 'function' normally. However, 'filling up with sleep' was often framed as time consuming or 'a waste of time' and therefore a 'luxury' that many people could not 'afford', leaving them 'running on empty'.

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"We want to treat [sleep] like *fuel* - how much do people have, how long will it last them, and when do we need to fill them up again" (Greg Belenky of The Walter Reed Army Institute of Research quoted in *The Guardian*, 29th July 2004, p.4)

Modafinil enters the story, again in a heroic form, a way to 'keep going', 'a pharmaceutical miracle' that could 'change modern life' or, more modestly, help us sleep 'more efficiently' when time is at a premium. Taking modafinil was therefore constructed as an alternative to sleep, allowing people to 'remain functional' both physically and mentally. The drug was depicted as being able to 'keep the user awake' or 'keep them going', 'reduce tiredness' by 'turning off' or 'cutting out' a person's need to sleep; an alternative method of providing 'power' by allowing sleep to be 'traded' for more time, and enabling individuals to adjust to the demands of a living in a 24/7 culture. Visions of a future world were imagined by journalists constructing modafinil as a chemical replacement for sleep, a way in which sleep could be traded for more time awake:

"Modafinil belongs to a new class of awakening drugs known as eugeroics, which are unravelling the mechanisms of sleepiness. Once you've done that you will end up in a world where the need to sleep is optional. I would say that will happen within the next quarter of a century." (*The Sunday Telegraph*, 4th January 2004)

The SLEEP IS FUEL conceptual metaphor links to wider commodification narratives relating more generally to sleep and wakefulness. Situating stories about modafinil within a commodity framework links the novel and unfamiliar to pre-existing narratives regularly found in the media which present 'sleep' or a 'good night's sleep' as a consumer good (Williams, 2005; Williams & Boden, 2004). A plethora of different products selling 'sleep' are currently available, ranging from beds and pillows to herbal remedies and pharmaceutical products. Alternatively, products and strategies for

maximizing alertness and energy are also widely available. According to Williams (2005: 165), 'in the 24/7 society capitalism cashes in as both a disruptor and a guarantor of sleep'.

In discourse structured through a commodity framework, modafinil is constructed as a tool rather than a therapy, a way to technologically optimise the body/machine so it can function efficiently. The commodity frame was generally used to argue for pharmaceutical intervention in the sleep–wake cycle, constructing modafinil as an acceptable solution to social problems that have been translated into sleep-related matters (Williams, 2005).

Commodity frames were mostly located within discourses of modafinil use in occupational and recreational contexts and often used in conjunction with competition frames (Fig. 2). The use of commodity frames provided an alternative way to articulate moral arguments for taking modafinil without necessarily having to demarcate the medical and non-medical uses of the drug. Through commodity frames wider societal concerns about the dangers of 'normal' sleepiness are brought into the discussion, allowing moral arguments for individual performance augmentation to be made on the grounds of both individual and public safety.

Competition frames: beating sleepiness

The competition metaphorical frame was found across all four discourses and competition metaphors were the most abundant in the corpus by far. The competition metaphorical frame was configured from several components of the competition source domain, including that of: competitors; rules of the game; speed and distance; and that of a prize or goal. The competition frame was based around a metaphorical competition taking place between an individual and their body/bodily functions. Within this frame the body was viewed as malleable or 'plastic' and therefore open to biomedical augmentation, enhancement, improvement and design. Modafinil was

constructed as a way to 'beat' sleep, an enhancement tool rather than a therapeutic that one could use to 'eliminate the need' for sleep altogether.

"Sleep drug beats MS Fatigue" (*BBC News*, 20th January 2002)

Through the use of competition frames modafinil was often located within a 'superhero' storyline. In this well-known narrative, taking a drug (or other substance) transforms the individual in some way thus enabling performance beyond the norm. In this vein, the use of the technology was depicted as enabling an individual to 'enhance', 'increase', 'improve', 'boost' or 'better' their performance and capabilities outside of a 'normal' range, the literal outcomes of winning a metaphorical competition against the need to sleep.

Competition frames were used with almost equal prevalence to argue both for and against pharmaceutical intervention in the sleep–wake cycle, and were found across all four discourses (Fig. 2). The competition frame was often situated within articles discussing literal competitions where individuals would be depicted as not only competing internally against sleep, but also engaged in actual competitions on the sports field, in the workplace or during exams. This rhetorical strategy allowed parallels to be drawn between the two situations and similar moral judgements to be made. Using a drug to 'beat sleep' was often equated to cheating in the literal competition through the provision of an unnatural advantage that was condemned as illegal or unfair.

Where a link to literal competition was more tenuous, metaphoric and other linguistic expressions were often used to compare modafinil to drugs such as caffeine, a substance already in widespread usage around the world to 'beat sleepiness'. This rhetorical strategy sought to justify the use of modafinil in society through a context in which such a goal is conceptualised as a normal or everyday occurrence. The competition frame enabled strong social values relating to competition and fairness to

be articulated. The debate was focused at the level of the individual, with arguments based around freedom and autonomy and to what extent one should be allowed to choose what one does to one's own body. When expressed through this frame, the outcomes of taking modafinil were constructed as either individual improvement or individual detriment.

Overall, the three metaphorical frames were used to different extents across the four discourses in which modafinil use was discussed in the media (Fig. 2). Uncovering the underlying structure of media discourses through metaphoric frame analysis enables a deeper understanding of how different arguments are expressed and linked to specific sets of cultural values with distinct moral implications. War metaphors were related to 'healing', commodity metaphors to 'efficiency' and linked to discourses of 'public safety', whereas competition metaphors were related to 'individual improvement'.

Figure 2: Prevalence of metaphorical frames in each discourse
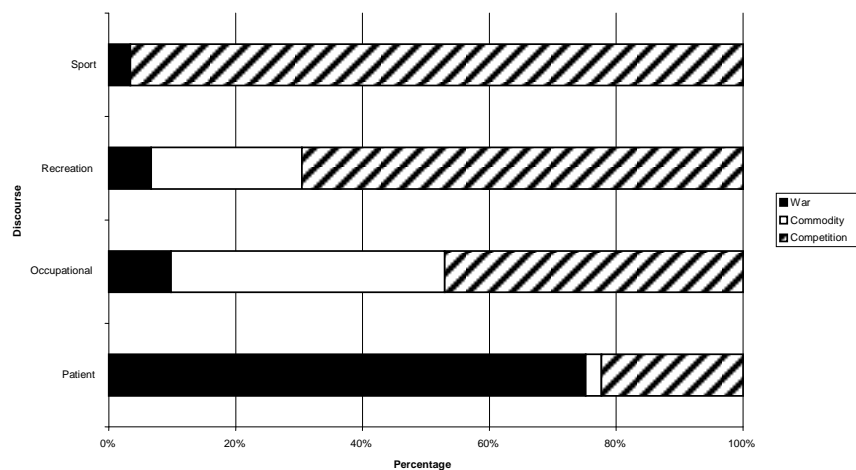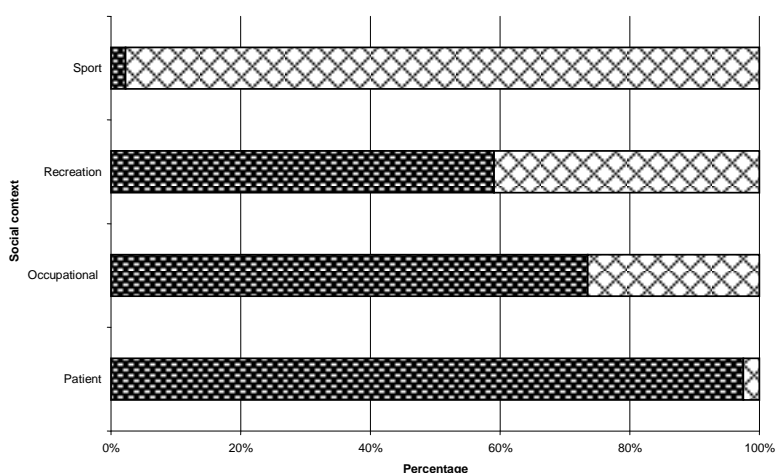
Metaphorical framing of sleep discourses

This section moves on to assess how the three central metaphorical frames were used to structure four types of discourses about the (il)legitimate use of modafinil in four domains of social life: the use by patients, for recreation, in the context of work and in sport. These discourses broadly relate to and overlap with the four key themes of 'medical conditions'; 'lifestyle choices'; 'military operations'; and 'sporting competition' that have previously been identified as of importance (Williams et al., 2008a). This analysis, by contrast, focuses on how the particular use of frames affects the boundary between medical and non-medical constructions of pharmaceutical intervention in the sleep–wake cycle in these four contexts. The complex relationship between medicine and enhancement is discussed through consideration of the functions of the rhetoric of medical authority in the media discourse, the type of bodies being (re)constructed and the normative assumptions embedded therein.

Patient discourses: abnormal bodies

Patient discourses were predominantly structured through the war metaphorical frame (Fig. 2) and were overwhelmingly in favour of pharmaceutical intervention in the

sleep–wake cycle (Fig. 3) as a method of maintaining or restoring a 'normal' body through the tools of medicine. The organisation of discourse around the concept of normality has the effect of not only describing how things are, but also inferring how they *ought* to be (Hacking, 1996). Patient bodies were designated as 'abnormal' and in need of correction or normalisation (see: Fraser & Greco, 2005: 17) with pharmaceutical use constructed as a legitimate medical intervention in all instances. By giving the individual control back over their sleep–wake cycle, modafinil was framed as a chemical solution to restore the body to a normal level of functioning and allow the individual to be able to lead a more 'normal' life. This rhetoric is evident in the data extract below which we are told comes from thirty-year old Henry Nicholls, a London-based science writer who is talking about his experiences of taking modafinil to treat narcolepsy:

'Before, I used to worry that I'd never be able to hold down a normal job, because when the sleepiness took over there really was nothing I could do. Now I am able to function like anyone else. I take a 100mg dose in the morning and in the evening I go to sleep like anyone else. Conversely, if I forget to take it, the symptoms come back almost immediately." (*The Sunday Telegraph*, 4th January 2004)

The metaphorical war frame was used to justify pharmaceutical intervention at both the individual and societal level, with the rare sleep disorder narcolepsy often the main point of reference through which moral reasoning about pharmaceutical intervention in the sleep–wake cycle was articulated. Interviews with narcoleptics frequently appeared in this discourse adding a human-interest dimension to the disorder and its treatment. Narcolepsy was described as 'a disabling condition which interrupts studies, makes work impossible and destroys relationships' (*The Independent*, 4th March 1998). The treatment of narcolepsy with modafinil was constructed as a positive action, enabling the narcoleptic to overcome their disability and restoring the

individual to a regular pattern of wakefulness during the day and sleep at night, as illustrated in the data extract above and in the following example:

 ''I am fighting a constant battle to stay awake. I know when I get tired, so I take a tablet at those times to prevent that tiredness'' (*The Daily Telegraph*, 1st October 2002).

This resonates with a substantial body of social research into the use of metaphors in discourses relating to many different areas of medicine and disease (Riesfield & Wilson, 2004). Research in this area claims that metaphors can have a powerful influence on the practice of medicine and the experience of illness. The war metaphor is often prevalent in such discourses. According to Riesfield and Wilson (2004: 4025) 'war has an exceptionally strong focusing quality and its images of power and aggression serve as strong counterpoints to the powerlessness and passivity often associated with serious illness'.

This type of framing was also observed at a societal level. Wake-promoting drugs were often represented as protecting society from the dangers posed by the problem of excessively sleepy individuals which might disrupt other people's 'normal' life. One headline in *The Independent* alerted readers to this problem by announcing that people with narcolepsy can 'fall asleep at any time - even at the wheel of a car' (28th September 2000) and attacks of overwhelming sleepiness were blamed for 'causing death on the roads' (*The Times*, 5th March 1998). According to advice offered by *The Times'*s resident medical doctor, EDS is a 'dangerous condition and anyone with excessive daytime sleepiness should see their doctor' (*The Times2*, 26th January 2004).

Here a direct normative stance emerges: people who have sleep problems should see their doctor and ought to take medication to regain normal functioning of their body so as to not endanger themselves or others. Therefore, in patient discourse, medical

authority was strongly linked to behavioural directives articulating a strong normative position: 'normal' bodies are desirable and can be produced through medicine. There were very few exceptions to this overwhelmingly positive representation in the corpus where the benefits of taking modafinil were questioned. One example comes from a 2004 article titled 'In search of the miracle pill' (*The Sunday Times*, 14th November 2004) in which the journalist questions the efficacy of drugs taken for treatment purposes, suggesting that the effect of modafinil on those with sleep disorders '…may not be as marked as the patient expects'.

Sports discourses: natural vs. unnatural bodies

Sport discourses were dominated by metaphors of competition (Fig. 2) which were used to frame arguments against modafinil use and articulate concerns about fairness and legality. In direct opposition to patient discourse these were almost exclusively negatively orientated (Fig. 3). In the context of sport, medical language was not used to describe modafinil use by athletes with modafinil clearly differentiated as an enhancement technology. The use of modafinil by sportspersons was framed as deviant behaviour, whereby the power and tools of the medical profession were being used outside of medical authority by individuals to enable them to overcome their natural limitations and gain an 'unfair advantage' over others. Modafinil was described as stimulant drug that can boost performance and was often grouped with other drugs that have been reportedly used as performance enhancers in sport such as steroids and Human Growth Hormone.

"[The sprinters'] supreme performances in the 100 metres and 200 metres are utterly devalued by a positive test for Modafinil." (*The Times*, 3rd September 2003)

As illustrated above, the sport discourse was characterised by strong moral judgements about modafinil use in this context. Taking modafinil in sport was

represented as 'cheating', as devaluing the athletes' performance and as ruining their reputation. Competition frames constructed the act of taking modafinil in a sporting context as inducing an abnormal bodily state of prolonged wakefulness. Here the natural body was valorised with 'naturalness' equated to cultural conceptions of the normal, typical and regular (Fraser & Greco, 2005). It was argued that athletes should be 'clean', 'natural' and train hard as this is the only 'fair' and legitimate way to compete and to win. An example illustrating several elements of the competition frame and its normative implications can be found in the following data extract, in which an Olympic athlete condemns a fellow athlete's use of modafinil (this athlete later admitted taking modafinil and other banned substances as performance enhancers and testified before the Committee on Oversight and Government Reform):

'People might wonder how she had the nerve to go in front of the world's media and offer an excuse like a sleeping disorder, but her nerve existed long before that. It went back to the first time she took drugs and lined up on the track, claiming to be clean and trying to win medals off people who have legitimately trained hard' (*The Daily Telegraph*, 3rd June 2004)

The framing of modafinil through the competition frame as a way of overriding normal sleep was associated with strong negative normative values and acted to exclude medical narratives to describe sleepiness in this context. Therefore medicine was not given (or not claiming to have) any cultural authority over the sleep–wake cycle in this domain. However, the use of modafinil by professional athletes could also be considered as an occupational use of the drug. In addition, susceptibility to circadian rhythm disorders would almost certainly apply to this group whose working conditions involve travelling and competing across different time zones. Despite this, in the sport discourse, modafinil was portrayed as a 'sleep disorder drug' that had found illicit use in this context as an enhancement tool. This is interesting, given that the same drug is being taken to the same effect in each domain; the only difference being the context of use. Medicine was however still given rhetorical authority over the technology in

question by the media, despite the fact it has found uses beyond the limits of medical control. In the data extract below modafinil is described as a medication that when used out of its intended context, as a treatment for sleep disorders, becomes a performance enhancing drug.

"The IAAF will look at the fact that she did not apply for exemption by declaring Modafinil on any list of medications taken before the race, and then at the information freely available that identifies it as a performance-enhancing banned drug." (*The Times*, 3rd September 2003)

There were only two instances where commentators argued for the use of modafinil in sport. Both of these appealed to the concept of 'rules of the game' and consisted of quotations from professional athletes, both of whom tested positive for modafinil and defended their use of the drug arguing that it was not identified on the 'banned substance list'[28], and there was no evidence that it would have a 'performance enhancing' effect in sport. This rhetorical strategy was used to imply that therefore the athletes in question had not done anything wrong or punishable[29].

'I know I that I did nothing wrong and sought no advantage over my competitors…I am confident that things will work out in the end. The mere fact of this allegation is personally harmful and hurtful. I have never taken any substance to enhance my performance." (Professional athlete quoted in *BBC News*, 11th September 2003)

The controversy and ensuing media debate in 2003 around several athletes testing positive for modafinil led to public condemnation of the drug in this domain. It was depicted as a way to gain an unfair advantage over one's competitors through the

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28 Modafinil was added to the 'banned substances list' in 2004.
29 Interestingly, one article in the corpus written in 2005 reports that caffeine has been put back on the banned list in Australia after allegedly been used as a 'performance enhancing' substance (The Guardian, May 19th 2005) suggesting that the use of any substance that alters states of wakefulness and alertness is not acceptable in sport again illustrating the blurry lines between medicine, enhancement, performance and pleasure.

chemical enhancement of performance. Taking a drug to achieve this goal was damned even by those who tested positive for modafinil use, thus demonstrating the strong social and moral values (some expressed in terms of bodily cleanliness or purity) that are attached to competitive sport in the UK. Again, a relatively clear normative stance emerged: when there is no abnormality or impairment in functioning medical intervention ought not to take place as in these normal bodies this would not lead to healing the individual and, in addition, it would lead to 'unfairness' with regard to others in society.

Occupational discourses: the body as a trading place

Through the combined use of commodity and competition frames, in occupational discourses the body was represented as a trading place in which modafinil provided an alternative to sleep, and sleep could be traded for time. Individual bodies could be technologically optimised and adjusted to 'stay alert' or 'stay awake longer' and 'function more efficiently' in the modern workplace, making them more productive.

> "Studies in the US have found that helicopter pilots who had been kept awake
> for 40 hours functioned far better on Provigil, especially between the hours of
> 3.30am and 11.30am, when tiredness reaches its peak" (*The Guardian*, July
> 30, 2004)

Within the occupational discourse there was a debate over the extent to which medicine has authority over the bodies of sleepy workers. Conflicting standpoints were evident: sleep problems resulting from working conditions were viewed as either a 'normal' part of working life and modafinil therefore a social intervention, or alternatively working conditions were seen as causing some degree of 'abnormal functioning', making it possible to justify modafinil as a medical treatment. Despite such inconsistencies, the way in which this discourse was framed through commodity and competition metaphors enabled justification for the drug to be sought through

alerting readers to the dangers posed by a tired workforce (to both the individual and social body), rather than through a normative association with normal bodies.

"Provigil did bring about a modest improvement in the night-shift workers' problems: they were more alert when working and their accident rate on the way home was significantly reduced" (*The Times*, August 15, 2005)

Work-related sleepiness was often constructed as an abnormal physiological and psychological state and compared to the extreme sleepiness consequent of sleep disorders and resulting in similar impairment of functions. In this context modafinil was represented as an alternative to sleep, allowing individuals to adjust to disrupted patterns of sleep and wakefulness resulting from working conditions.

"The US army aeromedical research lab in Alabama has been testing the drug for possible use on helicopter pilots. They discovered that after 40 hours without sleep, 400mg of the new drug restored alertness to the patient's predeprivation levels." (*The Sunday Times*, July 9 2000)

In the above quotation the journalist is describing tests carried out by the US military at a medical research facility. In this statement the helicopter pilots are referred to as 'patients' with precise amounts of the drug able to 'restore' functions they have lost through working conditions. The use of medical language such as referring to modafinil as a 'prescription drug' and drawing reference to clinical trials or scientific studies published in medical journals on pilots, troops and shift-workers contribute to the framing of the use of modafinil amongst these groups as a medical intervention. The two statements in this group with more negative connotations relating to pharmaceutical intervention in the sleep-wake cycle by members of the workforce both related to fears of spread of usage to other groups or the potential for research into wake-promoting drugs to extend to 'removing' the need for sleep altogether.

Arguments in support of modafinil use in the workplace constituted three quarters of occupational discourse (Fig. 3). Many of these arguments were situated within 'horror stories' detailing the devastating consequences excessive sleepiness could have in the workplace. The backdrop to many of the articles in the corpus included descriptions of the dangers of being tired at work, including 'friendly fire' in war zones and major disasters such ship wrecks and train crashes that were attributed to a tired workforce. As illustrated below, modafinil was positioned within these arguments as a type of 'saviour' that could be used not only to sustain the capability of the workforce but keep people alive and prevent accidents:

"Called Modafinil, it has already been investigated by military organisations in France, the US, and Britain, where keeping weary soldiers alert can prolong their lives." (*The Independent*, 10th July 1997)

This rhetorical strategy brings wider social and environmental costs of a tired workforce into consideration, often on a global scale. Pharmaceutical intervention in the sleep-wake cycle is therefore constructed as the moral and socially desirable action to take to counter the effects of work-related sleepiness. The boundary between medical and social uses of modafinil was not clearly demarcated within work-related discourse. Although work-related tiredness was sometimes articulated within a medical framework as impairment or abnormal functioning, so eligible for medical treatment, it was also often described as a normal consequence of lifestyle choices with sleepiness a natural, but often unproductive or unnecessary occurrence. In these situations pharmaceutical wake-promoting drugs were equated with non-medical interventions to 'extend' periods of wakefulness or overcome work-related tiredness which positions their usage closer to a form of enhancement.

As illustrated in the data extract below, a second rhetorical strategy found in the occupational discourse to argue for the social use of modafinil was based upon normalising the idea of taking a performance enhancing substance at work:

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''American users describe in enthusiastic terms how the pill has enabled them to stay awake without the jitteriness and anxiety brought about by large amounts of caffeine'' (*The Sunday Times*, 4th July 2004).

Modafinil was compared to other drugs used in the workplace (e.g. caffeine) with claims made that modafinil 'is already being used' in this context as an 'enhancement' rather than as a 'therapy'. Increasing sales of the drug were attributed to shift workers taking modafinil 'off-license' to 'remain functional after a busy night' (*The Times*, 2nd July 2005). In a military context, modafinil was more clearly demarcated as an enhancement technology with the 'soldier–modafinil complex' represented as a 'cyborg fusion' (Haraway, 1990), blurring the boundaries between body and technology (see Williams et al., 2008a). Soldiers on modafinil were constructed as being able to adapt to their environment and perform with maximum efficiency. Here, competition metaphors were used to frame the drug as a way of gaining a 'military advantage' (*The Independent*, 28th September 2000), providing troops with an 'extra edge' (*BBC News*, 26th October 2006) and allowing them to 'feel more alert' and function 'better' (*The Guardian*, 30th July 2004) without needing to sleep. It was suggested that modafinil was a 'better' option than existing drugs said to be already used by the military, such as amphetamines, as it works 'longer', is 'more effective' and has 'fewer' side effects.

Around twenty-five percent of occupational discourse presented arguments against pharmaceutical intervention in the sleep–wake cycle (Fig. 3). These often drew upon potential detriments to health, including abuse and addiction, therefore demonstrating the moral judgements attached to taking drugs outside of medical authority in British culture. Opposition to modafinil use by the workforce was often justified at the level of individual safety and liberty, invoking fears of coercion and harms to individual health through the uncontrolled use of the 'tools of medicine'.

In one instance the commodity frame was used to describe soldiers' bodies as being 'wired awake' (*The Guardian*, July 29th 2004) through modafinil, as if they were being coerced into prolonged wakefulness and forced to survive with little sleep. The word 'controversial' was used to describe the military use of modafinil on four occasions with the MoD reportedly 'denying' military use of the drug, thus highlighting a degree of disagreement about the use of this drug in work-related circumstances. The voices of concerned doctors and scientists were used to criticise the non-medical use of modafinil, blaming overwork or stress for excessive sleepiness at work. Using modafinil to prevent sleepiness was viewed as allowing people to 'work harder and play harder' drawing on fears of potential detriments to health with rest rather than pharmaceutical intervention put forward as a solution. Within the competition frame many of the arguments against the use of modafinil in a work-related context related to the 'rules of the game' component of the frame resulting in the normative arguments bearing great similarity to those evoked in the sport discourse. Furthermore, at a societal level questions were raised over the value of using drugs to improve performance. The costs of enhancement on a wider scale were evident here and included fears based on increasing competition in all areas of life and homogenising individuals into a norm influenced by current social and cultural standards.

To summarise, despite a high prevalence of medical rhetoric, justifications for the legitimate use of modafinil in this social context were generally sought through appeals to individual and public safety where the technology was framed in terms of its ability to protect society (the social body) from harm and danger. Normative questions emerged then around modafinil use on the boundary between 'work' and 'lifestyle'.

Recreational discourses: the 'plastic' body

Recreational discourses were structured through both competition and commodity frames (Fig. 2). Whereas societal issues dominated normative reflections in

occupational discourses, the focus shifted to individuals and their lifestyle choices when modafinil use was discussed in a recreational context. Within this discourse the body was conceptualised as 'plastic' in the sense that it could be altered, changed, moulded, and designed. It was constructed as a site for optimisation and improvement, a commodity through which one could construct oneself. This understanding of the body fits into a paradigm of consumer culture that is based on an ideology of our ability to create and transform, in which one can choose both who one wants to be and how one wants to be. In this context, arguments for and against pharmaceutical intervention in the sleep–wake cycle were given almost equal attention (Fig. 3). Within recreational discourses opposing viewpoints clashed over whether modafinil use should be viewed as a way of 'trading sleep for more time' and 'improving ourselves' by overcoming our evolutionary constraints or inducing an 'unnatural' and 'abnormal' state that could be detrimental to health and lead to widespread psychological addiction and drug abuse.

> "An obvious target when trying to claw back more time is sleep, that big chunk of the stuff that squats apparently unproductively in the middle of every 24 hours" (*The Times*, 2nd July 2004)

A natural/unnatural dichotomy was often used to frame arguments against the recreational use of modafinil and raise concerns over potential harms to health that could result from using pharmaceuticals to achieve a state of prolonged wakefulness. One article in *The Guardian* (25th April 2006) used this dichotomy to criticise the whole idea of human enhancement, arguing that human enhancement is based upon the assumption that we are naturally inadequate. Other articles in the sample expressed fears that it may be difficult to 'stay natural' (*The Guardian*, 30th January 2006) if drugs such as modafinil become readily available due to improved performance and increased competition, and ethical questions were raised about the use of drugs to gain advantages over others (*BBC News*, 13th July 2005).

The majority of this discourse positioned the recreational use of modafinil as a social use of the drug. Pharmaceutical use was represented as away to reduce time spent sleeping, a method of potentially 'eliminating sleep' altogether and a tool to enhance one's cognitive abilities. Modafinil was tipped as the next 'wonder drug' to hit the UK with claims made that it could become the 'pharmaceutical equivalent of the electric light bulb' by 'extending the waking day' (*The Independent*, 4th March 1998). However, and perhaps surprisingly, in around one third of recreational discourses, the use of modafinil for 'self-improvement' was framed through the rhetoric of medicine. The competition frame allowed for the legitimate limits of medical authority to be debated within the media and the tensions between medical and non-medical uses of technology to improve oneself to be expressed. An important aspect to this debate was the kind of bodies medical intervention was thought of as producing and whether this was a legitimate role for medicine to play in society. For example, one article in *The Guardian* asks: 'We improve ourselves via cosmetic surgery, why not also improve our brains?''(30th January 2006).

Such comparisons between modafinil (as a cognitive enhancer) with cosmetic surgery (a medicalised form of physical enhancement) were drawn to argue that medicine is already an institution through which we alter and enhance our normal bodies. Other arguments positioned such enhancement uses of modafinil outside of medical control referring to them as 'lifestyle abuses' of 'sleep disorder drugs'.

> "Provigil is increasingly being used as a lifestyle drug by people who do not have sleep problems. Suggestions that it could also help boost weight loss and mood have made it even more popular. Clubbers are using it to keep partying through the night, while businessman are buying it to help them through long days in the office, and students are taking it to keep revising. Doctors have warned that the drug can be psychologically addictive and can induce headaches and nausea" (*The Independent*, April 18, 2006)

The framing of modafinil use in this way resulted in the normative debate within recreational discourse being positioned at the individual level, with questions emerging about whether we should be allowed to alter ourselves using this technology. Fears and concerns surrounding potential consequences of individual augmentation were however often aimed at the social body. Often visions of the future were imagined in which the availability of such neurotechnologies were depicted as having detrimental effects on society. For example, in a story titled 'Pleasure pills to perk us up and boost the brain' reporting on the publication of government report, Drugs Futures 2025? the journalist writes:

"...the pharmaceutical industry might change its focus from drugs that treat mental health to cognitive enhancers, "mental cosmetics" and treatments for addiction [and] may not make new medicines for mental health conditions."(*The Daily Telegraph*, July 14, 2005)

With no impairment of functioning it appears more difficult to justify modafinil use without the moral imperative of restoring health. However, around one third of recreational discourses did construct modafinil use through the rhetoric of medicine. Interesting questions arise here regarding the role of medicine in self improvement and the conceptual relationship between medicine and enhancement.

Summary and conclusions

This chapter explored representations of the wake-promoting drug modafinil in a corpus of UK media reports. Media reports on modafinil were categorised into four domains of discourse: patient, sports, occupational, and recreational, broadly relating to 'key themes' that have previously shown to be of importance (Williams et al, 2008a). Each discourse was built up around the specific deployment of the metaphorical frames 'war', 'commodity' and 'competition' that acted to construct the biological body in a particular way. How the body was framed in each discourse

impacted upon how modafinil use was portrayed in terms of therapy or enhancement and the level of engagement with a medical rhetoric. This had distinct normative implications strongly influencing the legitimacy afforded to modafinil use in each domain.

Both the patient and sports discourses were organised around the valorisation of 'normal' or 'natural' bodies in which relatively clear normative directives emerged: abnormal bodies and bodily functions (attributed to both biological and social factors) should be fixed through medical technology, whereas this technology should not be used in 'normal' bodies which do not need 'healing'. This left room in the middle for debates regarding the legitimate role of medicine in society and the kind of bodies over which medicine is perceived to have authority.

Work-related discourses were centrally concerned with notions of repair of lost functions or the prevention of harm- conceptually, an area medicine is increasingly moving towards with preventative medicine initiatives and health campaigns. Interestingly, in discussions of shift work, this was represented as not only a risk factor for other health problems, but one of the causal factors for a disorder in its own right, SWSD. At present only a small group of individuals with EDS are thought to have SWSD. Through this small study it is not possible to reach a definitive conclusion as to whether the media are promoting the medicalisation of work-related EDS through the expansion/extension of the disease boundaries for SWSD.

Although there was some evidence of such 'disease mongering' (Woloshin & Schwartz, 2006) in the occupational discourse, the majority of articles in this domain bypassed the medical/non-medical debate altogether. The potential consequences of abnormal functioning (excessive sleepiness and cognitive impairment) were framed in such a way that the normative positions emerging in the discourse did not rely on the concept of normality nor the distinction between medical and social uses of the drug. Instead justification was sought through appeals to wider non-medical narratives

relating to both individual and public safety. However, medical rhetoric was prevalent in more critical aspects of this discourse attending to potential negative consequences of using drugs outside of medical control. Despite the availability of a drug that can treat work-related sleepiness and associated cognitive impairments and the construction of a medical disorder (SWSD) to explain it (in its extreme form at least) a fully medicalised account was not presented in this domain.

Cultural conceptions of 'normality' were also central in the recreational discourse where debates were situated around the use of modafinil for enhancement or improvement of 'normal bodies'. The frame analysis conducted revealed that discourses concerning individual augmentation were often saturated with competition metaphors framing modafinil as an illicit 'performance enhancement'. In these cases, the rhetoric of medicine was often used to argue *against* the application of modafinil in these situations, framing its usage as outside of medical control and therefore unauthorised. In other instances individual augmentation via modafinil was constructed as a medicalised form of self-improvement. Questions were raised regarding whether modafinil should be used for enhancement purposes, and if this would be an abuse of medicine leading to the production of abnormal or unnatural bodies.

Arguably, media constructions of modafinil as a medicalised 'enhancement', in the context of the commodification of medicine in a global healthcare market coupled with the rise of the patients-as-consumer, could shape the demand for medical treatments to alter states of alertness, thus contributing to the transformation of medicine into a 'vehicle for self-improvement' (Conrad, 2007:140). However, in situations where no impairment or threat to society was identified in the media data, there was a lack of moral imperatives to justify the enhancement of 'normal' bodies through medical intervention. Instead, medical rhetoric was coupled with the moral obligation to restore health and normality, suggesting culturally at least, the Parsonian sick role prevails

(Parsons, 1957). This could however be due to the production of media texts where stories tend to be built up around the opinions of certified 'expertise'.

Using a new method and data set this study confirms to an extent Williams et al. (2008b) findings that at the conceptual level at least, 'sleep is indeed another chapter in the medicalisation story'. However, media coverage of modafinil is complex, with medicalised discourses deployed in some contexts more than others. The use of cognitive enhancers was contested in work-related contexts where new disorders are being defined and in academic contexts where cognitive enhancement drugs are purportedly being used for the improvement or extension of abilities to increase performance and productivity beyond the norm. In both of these contexts the technology was not framed in either exclusively medical or social terms, instead modafinil use straddled the boundary between therapy and enhancement, and normative reaction was also mixed. Discussions of modafinil for self-improvement revealed cultural anxieties about the future role of medicine in a culture of consumerism, and the kind of bodies medical technology *should* be used to alter. These findings were used to inform the second stage of empirical work which focuses on further exploration of these 'boundary' cases (explored further in chapters 5-7).

When thinking about 'uses and abuses' of pharmaceuticals in terms of therapy and enhancement it is actually very difficult to go 'beyond medicalisation' as Williams et al (2008a) propose as issues of 'pharmaceuticalisation' are undoubtedly bound up in processes of medicalisation and their normative connotations. Through the analysis of media data it became apparent that there is a strong qualitative difference in the social and ethical issues raised in each domain of discourse. There are clearly different forms of enhancement, so how and where the technology was used became more important than its 'biological composition' (Conrad, 2007). At present it appears difficult to justify using medical technology for enhancement without the moral imperative of restoring health. In the case of new medical technologies such as modafinil that are approved for the treatment of specific conditions but can be used as

enhancements for other capacities, medicalisation may in fact be a *requirement* in the legitimation of technological/pharmaceutical intervention whilst medical professionals act as 'gatekeepers' (Conrad, 2007) for their delivery. Medical norms play a role in setting social norms through the labelling of the abnormal. As such, further medicalisation of sleep at the conceptual level may lead to the expansion of medical social control through the creation of new expectations for bodies, behaviour and health. This will be explored in greater depth in Chapter 5: the scientific and medical constructions of sleep, cognition and modafinil use.

As this analysis shows, through consideration of the normative issues allied to medical authority, medical authority acts to legitimise enhancement for repair, restoration and relief of suffering, whilst being deployed to criticise enhancement in bodies already perceived as functioning normally. This therefore leads to the conclusion that conceptually the acceptability of 'enhancement' is strongly tied to context and intricately related to medical social control.

The era in which we can pharmaceutically manipulate sleep and alertness it seems is upon us. Pharmaceutical companies are reportedly working on new technologies to alter sleep thus creating further medicalised solutions to augment individuals to perform in line with cultural expectations and ideals rather than prompting a change in the way we live our modern lives and the social conditions that have contributed towards the conceptualisation of sleepiness as a problem in the first place. However, if the chemical enhancement of normal bodies continues to be normatively constrained, a world in which one is free to technologically alter their cognitive functioning and need to sleep will remain a cultural biofantasy.

Chapter 5: Scientific constructions of sleep, modafinil and human enhancement

<u>Introduction</u>

As discussed in Chapter 2, expert constructions of sleep, cognition and society are important to uncover because scientific medicine defines states of normality, health and illness and issues guidelines, advice and recommendations on how people should live their lives (Armstrong, 1995). As the medico-scientific gaze penetrates deeper into the mind, conceptualisations of normality, pathology, health and illness are subject to change (Foucault, 2001). The linguistic medico-scientific representations of medicine, illness, disease and the body are therefore influential in the construction of both medical knowledge and lay understandings and experiences (Ettorre, 1999; Nelkin; 2001; Nesbit & Mooney, 2007; Nisbet & Scheufele, 2007). The development of new technologies that can be used to alter states of consciousness, can influence neuroscientific and medical understandings of the mind and the body. Through the availability of new neurotechnologies, such as modafinil, the brain and its various functions are then increasingly thought of as flexible, open to manipulation, pharmaceutical control and transformation (Martin, 1994; Wehling, 2005). As sleep increasingly comes under the purview of scientific medicine it is important to uncover how scientific and medical knowledge are providing us with new ways of understanding ourselves and our behaviours and shaping desires for transformed bodies and identities (Clarke et al., 2003; Rose, 1994; Gray, 2002).

The aim of this chapter is to describe how the use and users of modafinil are framed within medical and scientific discourse. Specific research questions addressed include: How are sleep, cognition and the body conceptualised by 'sleep experts'? How is modafinil use understood in this domain? What sociotechnical scripts are associated with modafinil use and how is it positioned as a medical or non-medical

technology? What role is given to medical authority in deciding if particular uses are acceptable?

Firstly, scientific constructions of sleep, cognition and society are described to understand the framework within which modafinil use is understood by sleep experts and investigate which methods of sleep regulation are deemed to be appropriate or acceptable. The second section of this chapter explores scientific configurations of modafinil use by different groups of users and how these are being legitimated and contested within the sleep science and medicine communities. Finally, conceptualisations of modafinil as a cognitive enhancer for use in 'healthy' populations are considered.

Sleep, cognition and society

This section provides some background as to how sleep experts spoke about sleep on a biological and social level and how they understood the relationship between sleep and human cognitive functioning. Firstly, representations of sleep as a biological process and as a social activity are considered. Following this, the ways in which sleep problems were conceptualised is explained and the social impacts of these problems explored.

The mechanics of sleep

Respondents talked about sleep using multiple and overlapping frames of reference that encompassed biological mechanisms and processes, behavioural characteristics, social and cultural contexts and meanings. However, first and foremost, respondents described sleep in biological terms as a brain- based process that is under biological control. Sleep was thought of as being 'essential to life', a vital part of human existence, much like air, food and water with sleepiness compared to feeling hungry or thirsty. Through the use of biomedical language and terminology the biological body

was framed by sleep experts as a machine that has been designed to operate in a specific way. Mechanical and informatics metaphors were used to refer to the brain as the body's central processing unit and the eyes as 'sensors' detecting signals from the environment and transmitting these to the body's 'internal clock'. As illustrated in the data extract below, within this frame of reference, sleep and wakefulness were conceptualised as being on a continuum, as mechanical processes of rhythms, cycles, patterns and stages of electrical activity generated and regulated by internal 'control structures' located in the brain.

"…the way we define sleep in our own species is on the basis of electrical activity in the brain" (Adrian, Sleep scientist)

Respondents described two brain-based systems that act in oscillation to control the sleep-wake cycle: the 'homeostatic drive' and the 'circadian system'. The former is thought to induce sleep and the latter to promote wakefulness. Respondents regularly asserted that because of the way these two systems operate, humans simply cannot go without sleep. In this biological view the brain is thought to be programmed to take sleep despite any efforts of the individual to stay awake; the body will eventually shut down. Respondents argued that the human brain is 'programmed to stay awake for 16 hours' (Dan, Clinician) followed by around eight hours of sleep in each 24 hour cycle. However, individual differences were thought to be considerable and many respondents felt uncomfortable in offering average numbers. All agreed that less than six hours sleep per night would be sub-optimal and less than four hours sleep per cycle was identified as extreme sleep restriction.

Physiological and genetic explanations were frequently given to explain why different people prefer to sleep at different times. As explained by Jane, each individual has a brain-based internal body clock that 'ticks' according to its own endogenous periodicity. The length of a person's internal body clock is thought to be determined by their biological make-up, which has a direct influence on the time they sleep. People

who prefer to get up later in the morning and stay awake later into the night were referred to as 'owls'. People who prefer the opposite were referred to as 'larks'. This seemingly personal preference of when someone decides to go to bed was explained (in part) by the length of their internal biological clock at a genetic level.

"...we all have these internal clocks that persist in the absence of time cues...The later your internal clock period, the later you are likely to live on a normal day. Owls get up late and go to bed late. Owls have longer internal clocks. Larks have shorter internal clocks and get up and go to bed earlier" (Jane, Sleep scientist)

Despite giving accounts of sleep and wakefulness as being under biological control, respondents did not take a deterministic view by attributing sleep timing and duration solely to biological mechanisms and genetic influences. Respondents acknowledged that despite the biological mechanisms that exist within us to control sleep there is also a degree of flexibility where, to some extent, individuals can choose to change their sleep patterns and trade in sleep for social opportunities. On a social and cultural level, sleep was described as something we learn to do appropriately, an activity that is riddled with rituals, routines and habits we develop throughout our lives and strongly influenced by the social and cultural norms that operate within a particular society. Respondents spoke about the day/night divide as one of the central features around which our lives are organised. On a socio-cultural level, sleep was described as taking place in a particular space, whilst one is wearing specific clothes and in the presence of certain people and not others. Above and beyond biological survival, sleep was attributed to an essential part of care and nurturing that has emotional significance conveying comfort, security and belonging, affecting relationships between couples and within families.

Sleep in modern society

Across the scientific discourse modern society was constructed as a highly stressful place to live where people are increasingly busy, short of time and trying to cram more and more activities into their waking day by cutting back on sleep. Respondents acknowledged that people can and do use available technologies- ranging from artificial lights to alarm clocks- to get up earlier and stay awake longer than their biology dictates. A wide variety of other environmental, psychological and lifestyle factors which might disturb sleep were also discussed. These included light exposure, noise, sleeping with a partner, diet, pain, working hours, family demands (e.g. having a baby to feed during the night), stress and rumination (being unable to 'switch off' at night). Several respondents described contemporary western societies as chronically sleep deprived estimating that up to 60% of the population do not get sufficient sleep.

> **"**Modern societies attempt to cheat biology…we have created environments in which the biology that we come naturally by collides with the environment and it collides with the culture..." (Bernard, Sleep scientist)

Visions of modern society were paralleled with romanticised notions of the past. Respondents described a time when people used to have a biomodal sleep pattern, their sleep periods encompassing a full twelve hours during the night in which they would have a first sleep, followed by a dip and then a second sleep. Research was also referenced which pointed towards a third period of sleepiness, occurring just after lunchtime, as providing evidence of human sleep being polyphasic in nature. By reference to these studies, sleep experts argued that humans used to sleep according to day length like animals do, but that this has changed due to a change in lifestyles and particularly since the advent of electric lights.

Experts feared that sleep is not understood properly and not taken seriously in the modern world and is becoming relegated in peoples' order of priorities. They explained

how our biology 'collides' with the cultural environments we have created, as people increasingly attempt to 'override' their biological processes in order stay awake for longer periods and achieve social goals. Although acknowledging how behavioural, psychological and lifestyle factors can affect the quality and quantity of sleep, all respondents agreed that they would not alter the basic rhythm of sleep that is under biological control and were adamant that it is not possible to go without sleep altogether. As shown in the data extract below, fears were often raised that interfering with the biology of sleep can have serious consequences for health.

 "…sleep is important and at our peril we mess around with human circadian functions…there's certain things you can do but there are limits to what you can do and there's certain costs of doing what you do" (Harry, Clinician)

Sleep deprivation and cognition

Many of the respondents interviewed were involved in undertaking scientific research to understand the risks of disturbed or shortened sleep, both physiologically and behaviourally[30]. On a functional level, what sleep does is still largely unknown within the sleep science community, although there are numerous theories that drift in and out of favour. However, the effects of going without sleep, or sleep deprivation are fairly well characterised.

The physical effects of sleep deprivation described by respondents were vast and often severe, thus reinforcing the importance of sleep to human health and cognitive performance. The sleep deprived individual was described as feeling very sleepy or tired, 'horrible' or 'unwell', their 'guts would churn' and appetite be affected. Sleep deprivation was associated with the onset of a range of serious health conditions including obesity, heart disease, cardiac arrest, stroke, diabetes, high blood pressure, cancer and metabolic syndrome. In addition to these physical effects, psychological,

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[30] The notion that we are a sleep deprived society is contested by some prominent members of the sleep science community who argue that short sleep does not harm health (See: Horne, 2007).

cognitive and emotional impacts were also discussed. Sleep was described as crucial for emotional regulation, mental health and cognitive performance. The impacts of sleep deprivation at an individual level that were described included: feelings of mental 'fuzziness', lapses in attention, memory problems, inability to focus, trouble with complex decision-making, feelings of frustration and low mood, anxiety and depression. Sleep was said to influence a persons' sense of humour, sociability and ability to think innovatively. Sleep deprivation was also considered to drastically affect cognitive performance. However, many respondents discussed that even though an individual might be severely impaired through sleep deprivation, they would be likely to be unaware of just how impacted they are. As shown in the data extract below, one respondent went as far to say that sleep makes us who we are as people: it is part of what makes us human beings.

"…sleep allows us to be the sort of people we'd like to be, relaxed, intelligent, social animals coming up with new and exciting concepts and ideas" (Adrian, Sleep scientist)

Sleep deprivation was perceived to be of enormous importance because of its association with major disease but also due to indirect harm caused by individual performance deficits on a wider societal level. A reduction in sleep was frequently linked to an increase in the likelihood of accidents and mistakes that could cause harm to others. The dangers associated with 'drowsy driving' and risk of 'fall asleep vehicle crashes' were commonly discussed where the level of injury and death was often compared to that of alcohol-related crashes. The comparison of driving whilst under the influence of alcohol and driving when sleep deprived added a normative dimension to the discourse, inferring a degree of culpability to the individual for their cognitive state.

Importantly, the effects of sleep deprivation were said to be subject to great variability across the population; it was argued that there was evidence that this too may be a heritable trait determined by biological make-up.

"…my lab has shown that the differences among people in response to sleep deprivation are stable and trait-like. That means that maybe there is a genetic basis to this" (Bernard, Sleep scientist)

Although it was argued that people are predisposed to react differently to sleep loss, as illustrated in the data extract below, how sleep deprivation impacts on an individual was also thought to be dependent upon the demands of their lifestyle.

"Lots of people lose sleep but don't really suffer the consequences because they don't have the demands and then it's not really a problem…For society, it's a different matter, it depends on when they start making mistakes that put other people in jeopardy or cause loss of productivity, or when they get health problems that become a burden to society" (Fay, Sleep scientist)

To summarise, sleep was understood as a brain-based biological process that is primarily under biological control but also open to a degree of manipulation through various socio-cultural, psychological and environment factors that can have an influence on sleep timing, duration and efficiency. Contemporary Western society was depicted as busy and hectic. Sleep experts frequently asserted that people do not give enough importance on sleep or recognition that it is fundamental to their physical and mental health, cognitive and emotive performance. Sleep deprivation was discussed in terms of both the medical and social problems it can lead to and lack of sleep was thought of as leading to real costs for the individual and society. In the next section, how modafinil fits into this understanding of sleep and vision of modern society as a medical treatment for the problem of sleepiness will be discussed.

Modafinil as a medicine: treating sleepiness

All of those interviewed had heard of modafinil prior to the interview, although some were much more familiar with the drug than others. Many of the respondents had worked with the drug in a research setting or prescribed the drug to patients in a clinical setting. In addition, two of the respondents (both US-based) had personal experience of using the drug as a treatment for jet lag. In general, the way in which modafinil was configured was not flexibly interpreted in this domain.

Modafinil was presented as a relatively safe and effective wake-promoting medication that could be used to treat excessive or problem sleepiness that is of clinical significance. Excessive sleepiness was conceptualised as a symptom of various medical disorders. The drug was referred to as 'remarkable' or 'terrific' due to its apparent lack of side effects when compared with other amphetamine-based treatments for sleepiness. All respondents agreed that modafinil should remain a prescription drug with its usage monitored by medical professionals. Some drew on the safety of the drug, pointing to how it is still relatively new and that its mechanism of action is not known, to argue that it should be kept under medical supervision, at least until the drug is proven to be relatively benign, and shown to have low potential for abuse .Often respondents spoke about the potential side effects of modafinil and the strength of its effects. They argued that there is not enough known about the drug for it to be made freely available, raising fears of side effects, drug-drug interactions, interactions with lifestyle, social addiction, and misuse. Although presented in media and neuroethical debates as a relatively safe drug, this claim was treated with caution by sleep scientists.

> "…there [is] information about the psychological effects of modafinil such as an increased rate of depression…there is a body of thought that says it should be used for sleepiness *per se*…I am a bit weary of that particular school of thought that encourages medication use without a clinical indication…my view is that primarily these need to be used for clinical indications" (Mas, Clinician)

There was a generally cautious attitude towards using drugs as a panacea for all the problems associated with sleepiness and sleep deprivation. Drugs were not seen as the whole answer; rather respondents thought that they should be seen as part of the 'arsenal' and they all agreed that relatively safe medications such as modafinil should be available for those who really need them. Drawing parallels with the media discourse, war metaphors were occasionally present in the talk of scientists and clinicians, although to a much lesser extent than in media stories, describing drugs in terms of weapons in the fight against sleepiness. Again, modafinil was conceptualised as a way to control sleepiness.

Legitimate users

Examples of legitimate patient groups and the appropriateness of pharmaceutical treatment varied somewhat between respondents dependent on their own area of expertise. Overall, examples of potential treatment sites given by sleep experts included recognised sleep disorders such as narcolepsy, sleep apnoea, insomnia, restless legs syndrome, hypersomnias, jet lag sleep disorder, SWSD (in some instances) and other physical and mental health disorders that may involve some degree of sleep disruption including ADHD, depression, anxiety, schizophrenia, dementia and cancer.

Whether respondents thought that modafinil should be used as a first line treatment for the 'symptom' of sleepiness was generally dependent upon the disorder in question and the professional affiliation of the respondent, with psychologists usually drawn towards non-pharmacologic or behavioural therapies in the first instance. Using modafinil as a primary treatment for the excessive sleepiness associated with narcolepsy was generally considered to be acceptable, although some respondents did also speak about benefits that lifestyle and dietary changes and scheduled napping, in addition to pharmaceutical therapy, could have for narcolepsy patients. Some respondents spoke about using modafinil in combination with other approaches

to treating sleepiness, such as with cognitive behavioural therapy (CBT) in insomnia patients and the mechanical continuous-positive-airway-pressure device (C-PAP) used to treat sleep apnoea patients.

Sleep disorders were conceptualised as being comprised of many different elements and typically referred to as irreducibly biological, psychological and social in nature. Although biomedical frameworks were used to describe why a sleep disorder might occur at the biological level and explanations included information about genes, hormone levels and brain-based structures, respondents also spoke in great detail about environmental factors such as light, noise, temperature, psychological predispositions and lifestyle factors such as diet, exercise, family situation, and working patterns as contributory factors. As explained in the data extract below, for this reason sleep disorders do not easily fit into a traditional medical model where diagnosis of a disorder automatically leads to medical treatment.

> "...they're not just biological problems that can be corrected by an imbalance of this or that together… for most of these disorders, the treatment that people get is not a curative treatment. It's a management strategy so therefore [pharmaceuticals] should be one of the tools, not the only tool that [is used…] it has to be seen in a broader context." (Harry, Clinician)

Although modafinil was understood as providing the pharmacological means to control sleepiness by those that use the drug, context of use was seen as incredibly important. The underlying cause of the sleep problem, patient choice and the availability or success of other non-pharmacologic interventions were often raised as important factors in deciding how to treat sleepiness. Several respondents discussed that often, patients who they had come into contact with, preferred non-pharmacological treatments for sleep problems. Medical professionals were thought to be equipped with the skills to decide, along with patient preference, whether modafinil was an appropriate treatment for that particular patient and their specific problem.

Within the psycho-bio-social framework used to explain sleep problems, that was adopted by many of the respondents, modafinil was clearly defined as a prescription medication that should be used when clinically appropriate as a medical treatment under medical supervision as a result of a clinical encounter.

Some respondents spoke about how drugs, including modafinil, are already prescribed off-label and the ways in which this is beneficial to society. They argued that although the prescription process has a degree of flexibility in-built into the system, there is still some sort of clinical judgement involved that protects society against potential negative impacts that widespread (ab)use of the drug could lead to. However, fears that there still might be social problems associated with the drug, even if it does remain under medical supervision, were also raised.

"…if you use sleeping pills as an example, where there still seems to be an abuse even though they're controlled through the prescription pad, the expectation is, if you've got something like modafinil out there, that you'll end up with the same run of problems, people will get addicted to the compounds and so on" (Orla, Sleep scientist).

Themes of performance enhancement and recreational use of modafinil by those without clinical disorders will be returned to in greater depth later on. The following section focuses on one area in which the application of modafinil straddled the boundary between legitimate medical treatment and abuse of prescription medication.

Shift workers: a contested user group

In this section, the various ways in which use of modafinil was positioned, argued against and legitimated in the context of one specific users group will be discussed.

Shift workers as patients: Shift work sleep disorder

Throughout the interview data, shift work[31] was portrayed as a lifestyle that comes with consequences impacting at various levels. Shift workers were positioned as 'at increased risk' of developing sleep disorders as well as various other biological and psychological problems in the short term. Shift work was constructed as a 'pathologic' environment through discussion of the heightened longer term risks of developing other serious health problems such as cardiovascular disease (CVD), type II diabetes, and cancer. Sleep loss and sleep deprivation were attributed to working in an environment that is not synchronised with a persons' body or internal biological processes, which in turn puts them at risk of developing health problems.

> "…shift workers…have an increased risk of heart disease [and] metabolic syndrome…you're trying to work out of synchrony with your internal clock…which is associated with sleep deprivation during the day and a four-fold increase in health risks." (Jane, Sleep scientist)

Analysis of the interview data revealed different attitudes towards the clinical significance of sleep problems experienced by shift workers. It was commonly acknowledged that all shift workers could potentially experience problems with sleep and cognitive performance when biological rhythms become disrupted.

> "…people who are on shift work are far more likely to develop problems with sleep because obviously it makes sense…they've not got the ability to regulate their pattern…..their body clock is all over the place…" (Lin, Clinician)

It was also generally accepted that some individuals will be affected more severely than others when immersed in a shift work environment. On a biological level, this

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[31] Examples of shift work discussed by respondents encompassed a range of occupations falling into a variety of socio-economic groupings and included both males and females and young and elderly workers. Different types of shift work were discussed including night, day, early morning and rotating shift work with the latter group being described as the most at risk or vulnerable to developing health problems.

phenomenon was frequently explained through geneticised accounts. There was said to be a 'genetic component' in the 'genesis of sleep disorders' thus explaining why some individuals are 'predisposed' to developing sleep problems when they are living 'out of sync with their biology' (Bernard, Sleep scientist). Through this lens, the body was reduced to a set of working parts with sleep problems explained as 'internal dysfunction'. Sleep problems and cognitive impairments associated with shift work were then, given a physiological basis and located inside the individual: inside the brain and body. As in data extract below, individual shift workers that developed sleep and performance problems were said to carry a genetic intolerance to shift work[32].

"….one particular clock gene which is related to sleep and performance problems in shift work…is called *per3* and it has length polymorphisms… it seems that there is a real genetic component to tolerance to shift work." (Jane, Sleep scientist)

SWSD is defined in the International classification of sleep disorders- version 2 (ICSD-2) as a circadian rhythm sleep disorder characterised by a primary complaint of insomnia and/or excessive sleepiness that persists for the duration of at least one month. This complaint must be associated with a work period occurring in the habitual sleep phase and other sleep disturbances must first be ruled out before diagnosis. It has duration criteria of acute, sub-acute or chronic and may be mild, moderate or severe (Fahey & Zee, 2008).

SWSD was flexibly interpreted by those interviewed and emerged as a contested disease category. Some respondents gave fully medicalised accounts of shift work

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[32] Despite the rich and detailed descriptions of the 'genetic basis' to sleep deprivation' or 'tolerance to shift work' and the frequent accounts of 'clock genes' and 'genetic mechanisms' involved in sleep regulation there was a notable absence of 'the gene' at the European Sleep Research Society (ESRS) 08 conference. I observed over 20 talks on shift work and/or shift work [sleep] disorder, during which 'genetics' was only discussed once. After giving a talk entitled '*clinical consideration and factors influencing tolerance to early morning shifts*' the speaker was asked 'what about genetics'? To which he answered 'some people respond better to sleep loss than others. This is a new aspect that we have to analyse. It is important'. So, although the majority of sleep experts interviewed for this study did discuss the genetic basis of sleep disorders, it is important to acknowledge in the sleep field overall genetic discourse may not be as dominant.

sleep problems, accepting SWSD as a legitimate medical disorder based upon its inclusion in the DSMIV or the ICSD-2. In such accounts, biomedical discourses were predominantly used to frame some individuals as genetically predisposed to react more severely than others to shift work with the disorder resulting from a gene-environment interaction. In the data extract below SWSD is framed in terms of a legitimate occupational disorder and compared other such conditions. The conceptualisation of SWSD, as a legitimate medical condition with a genetic or physiological basis, allowed for treatment via medical intervention to be proposed and shift workers to be configured in the role of patient. Here, similar rhetoric to other 'patient uses' was found through which modafinil was configured as a medication for treating sleepiness.

"The question of shift work disorder is fairly straightforward, it is in the nosology…and there is at least one medication indicated for treating it…Is it reasonable to have an occupational based disorder? I don't know, except that there is a whole field called occupational medicine where people have lots of occupational disorders…We are talking about medications for the brain to help us stay awake…if you don't treat night shift workers, we already know their cancer rates are higher than other people, their heart attack rates are higher – so it is not like they are living happy, healthy lives…" (Bernard, Sleep scientist)

Although biomedical discourses were dominant in the interview data overall, they were rarely used in isolation. Empirically, most respondents took biological, psychological, socio-cultural and environmental factors into account when discussing sleep and health in the shift work population. Pickersgill (2009) discusses similar findings in a study investigating the ontology of psychopathy in contemporary neuroscience. Whereas biomedical frameworks were used by respondents to explain why some individuals might respond differently to shift work, psychosocial discourses functioned to locate the effects of this 'internal dysynchronisation' in a social context. This is

illustrated in the extract below. Firstly, the respondent describes why shift workers may lose sleep and experience excessive sleepiness from a biological perspective:

"…you are losing sleep because you're trying to work at times when you're supposed to be asleep and trying to sleep at times when you're supposed to be awake, which your biology doesn't cope well with. From which sleepiness results…"

She then goes on to discuss how the deficits incurred from shift work become a social problem:

"…that is of such a magnitude that it becomes impossible to do the requirements of work and normal life, and then subsequently leads to other problems of family, problems of mood and so on" (Fay, Sleep scientist)

Other respondents questioned the physiological basis of shift work sleep disorder, regarding the condition as largely imposed and resulting from lifestyle and behaviour. Despite this, shift work was still understood as a lifestyle that comes with health consequences and shift workers were still considered as legitimate patients if their health was impacted by this lifestyle. The most important consideration for these respondents appeared to be whether the patient was suffering and how best they could be helped. This is evident in the data extract below where a clinical psychologist is talking about SWSD. He explains how shift workers who are biologically predisposed to react severely to working in a shift work environment may be diagnosed with SWSD, but because their biology is not able to fit in with socio-cultural working patterns, rather than there being something inherently wrong with carrying these particular genetic polymorphisms.

"I think in the UK…it's not…seen as a disorder…you just went on a shift, so you haven't created a disease process…There are individuals who don't adjust at all

to shift patterns and so for them it becomes an issue, these are the relatively small numbers of people who would be medicalised through occupational health, referral routes and so on …more so because they're seen as not being able to fit into the system- their biology just doesn't fit with that lifestyle so they can't do it." (Harry, Clinician)

In some instances respondents were more overtly sceptical of the disease construct and referred explicitly to the processes of co-construction that might be occurring, namely, that SWSD as a disease category was created after the effects of modafinil were discovered so that the drug could be indicated to treat a new group of patients.

"…it seems to me that they have created an entirely new disease just so that it can be treated by modafinil and it's called shift work sleep disorder" (Jane, Sleep scientist)

Resistance within the sleep field to the medicalisation of shift work was frequently acknowledged. This tension between the availability of an effective treatment and the resistance towards medicalisation of shift work can be seen in the data extract below:

"There has been this issue in the sleep field, they don't want to turn shift work into a medical condition…you've got a real disorder and we're going to treat you. I mean, it is a real disorder, but we're going to treat you pharmaceutically" (Dan, Clinician)

Others pointed to the general competence of doctors to argue that they make these kinds of clinical decision all the time, and that in consultation with the patient, if both parties felt as though pharmacological medication could help, then the shift worker should be prescribed the drug. All respondents agreed that modafinil should be under medical supervision, prescribed by medical professionals who would assess each

individual on a case-by-case basis prescribing medications to only those who really needed them.

"It is that doctors' choice whether they are going to prescribe [modafinil] or not…It falls with the individual practitioner to make a clinical decision at the time…" (Mas, Clinician)

Modafinil as a treatment of 'last resort'

The choice, or lack of choice, a shift worker has over their working patterns featured heavily in respondents' accounts. A few respondents discussed how some shift workers choose to do shift work because it suits them, financially, socially or otherwise.

"...I think a lot of people get caught up in wanting the bonuses, needing this, needing that…I think that people, in an ideal world, need to kind of re-think the priorities in their lives" (Gita, Clinician)

However, in the main, most respondents thought that shift workers had little -if any- choice over the shifts they worked and therefore did not position them as morally culpable for the health or performance problems they might experience. This position is evident in the account below where the respondent is discussing her thoughts on the prescription of modafinil for shift workers. Again, she casts modafinil in the role of treatment and shift workers in the role of patient despite believing that sleepiness is a normal consequence of shift work. She reasons that if the individual in question is unable to change their job, and that scientific knowledge regarding the optimal scheduling of shifts to avoid excessive sleepiness is still lacking, that taking modafinil could help the individual in some situations, implying that the risks associated with shift work could be avoided with modafinil treatment. In this case, the respondent sees modafinil as one temporary solution to some of problems associated with shift work.

"…I think a normal person working [shifts] will be always sleepy. I'm not against drugs…if [modafinil] is a help I can live with that…So until you have a perfect way to organise [shift rotations] and people have to be sleepy [and] driving, if there's something that can help or can avoid risks, yeah, why not?" (Gemma, Sleep scientist)

The majority of respondents thought that pharmaceuticals should be used as a 'last line of defence' or 'last resort' if they were the most effective option available; the individual was unable to change their lifestyle; other non-pharmacologic measures had failed to produce sufficient changes in their behaviour. Some of the non-pharmacologic treatments and measures discussed included 'bright light therapy' or 'optimal scheduling' to help shift workers 'adjust to shift patterns' and function efficiently. It was often proposed that pharmaceuticals should be used in conjunction with some type of psychological or behavioural treatment that was advised or even 'prescribed' by medical or other professionals. These involved sleep re-retraining programmes, courses of behavioural sleep medicine, psychotherapy, and life coaching to help the individual adapt to their work schedule and sleep more efficiently.

"I have lots of different strategies that I can use- meds, napping, bright light, melatonin, relaxation, meditation techniques…in my clinic I would look at the specific context of that specific individual and figure out what is the best mix of all of these things to help you sleep when you want to sleep and help you be awake when you want to be awake" (Charlie, Clinician)

In the data extract below the importance of medicalisation in the legitimation of modafinil use by shift workers at the conceptual level is evident.

"…what can we do best to make our shift workers work most optimally to promote their safety and the safety of others? And does that include drugs?

And when you put it that way it sounds bad. Does that include medical attention

for those that are in distress? Yes." (Edward, Clinician)

Hence, the overriding message was that modafinil use should be acute; with

behavioural measures providing longer-term benefits for the individual. Clinically, it

was acknowledged that the definition of SWSD needed further clarification and more

research was called for to determine when the symptoms of excessive sleepiness

and/or insomnia related to shift work become clinically significant.

Modafinil as a safety tool: the case of acute use

Occasionally, respondents drew on potential societal impacts of sleep deprived

workers to argue that in some situations although drug use might not be the answer

ideologically, practically speaking it would be acceptable if it was providing a level of

safety or preventing accidents. Cognitive impairments associated with sleep

deprivation were framed as a significant problem in the shift work population, posing a

danger to the physical, mental and emotional wellbeing of the individuals and also

impacting on wider society through an increase in workplace accidents and mistakes.

Some respondents referred to specific situations where acute use of the modafinil

might be beneficial for workers. Examples of people who might benefit from a dose of

the drug included: fire fighters and other emergency services, astronauts, military

personnel in combat situations, hospital workers and police officers on vital operations

during the night. In situations such as this, modafinil was conceptualised as a safety

tool rather than a medical treatment for a sleep disorder.

"…there could be certain acute situations where it would be a good thing to do. I

have no problems with somebody taking [modafinil] acutely, we know it's not

going to do them a lot of harm, you know, like in a fire situation" (Dan, Clinician)

Other respondents spoke about the shift work population more generally. At the societal level the dangers of sleep deprived workers were expressed in terms of accidents related to sleepiness such as car crashes. Indirect harm to society was discussed in the form of errors and mistakes due to for example, medical staff or policemen not getting enough sleep so not being able to react appropriately during the night shift due to tiredness and impaired concentration. Examples of major disasters, such as the Selby rail crash, the *Challenger* space shuttle disaster and the 3 mile Island disaster, were all attributed to impaired performance due to sleep deprivation and used to illustrate the societal impacts of sleepy workers on a wider scale.

> "….policemen, firemen, soldiers, surgeons, you've got lots and lots of people out there who are having to function at a very high level despite the fact that they haven't had a sufficient amount of sleep to allow them to function at a high level, and that's when society gets in trouble, and that's when we start to have a lot of accidents related to sleepiness." (Charlie, Clinician)

The reality that, as a society, we do rely on individuals that operate around the clock and we do have a huge population of shift workers was often used to justify the treatment of these individuals on grounds of safety. Some considered it idealistic to suggest that we could somehow turn back the clock and change how the working practices in modern society operate. The consensus view was that 'we are a 24 hour world' and that the phenomenon of shift work is here to stay. However, respondents talked about existing technological means for supporting those whose cognitive functioning might be impaired by shift work, stressing that in some occupations wake-promoting drugs would be more necessary than in others.

> "Sometimes it may not be a problem, like in pilots where so much of the cognition is supported by technology…The individual driving a fork-lift truck at 4 o'clock in the morning is not, so the capacity for them to hurt themselves or anybody else is high" (Adrian, Sleep scientist)

Often this type of acute use was suggested with caution. Respondents, considering the potential side effects of the drug, returned to the rhetoric that these drugs do not 'mimic biological sleep' (Adrian, sleep scientist) and that the scientific community is still not certain what all the functions of sleep are and therefore cannot predict the long term consequences of using wake-promoting drugs.

"…there are some very unpleasant side effects of modafinil that you've got to worry about…the situation where modafinil is probably the most useful [is] a single night…" (Jane, Sleep scientist)

Two respondents took a more conservative view towards acute use of modafinil arguing that it is down to the individual to take responsibility for their own health and behaviour. In the data extract below, the respondent imagines the future user and envisions how the drug could be taken in the workplace as a replacement for sleep or to increase productivity. The concern she raises, about acute use in one situation potentially leading to other non-clinical uses of the drug, is used to justify her stance that wake-promoting drugs should not be used acutely.

"I think we have to take responsibility for ourselves…I don't think it's a good idea to say 'I'm feeling a bit tired so I'll take one of these and then I'll be fine to do that open heart surgery that I've got planned'. I think that's a really bad idea…because where does that end then? If somebody comes in and they've woken at five instead of eight so they're a bit tired, 'oh I'll just have one of these and I'll be a bit more productive today'... a population of people who are all mediating themselves is something that should really be discouraged and that's where that would end up" (Lin, Clinician)

Several respondents discussed how they were personally involved in research developing countermeasures to prevent accidents, mistakes and other stresses in the workplace, whether disturbed sleep or shortened sleep arises due to a medical

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condition, a work/rest schedule or some other lifestyle variable. Such technical solutions to workplace sleepiness and impaired cognitive performance could eventually eliminate a need for the drug in the first instance. A number of these strategies involved 'human-machine interfaces', with visions of how workplace performance might be technologically optimised in the future, to ease the demands placed on individuals without a need for medication.

"There are other interventions that we can think about to make people safer when they're sleep deprived…There's human/machine interface issues...if we better understand the way that decisions change when we're sleep deprived… the next step would be to work with these interfaces, in order to help us make better decisions." (Charlie, Clinician)

To summarise, there was a general resistance to medicalise sleep in the shift work context. The variety of interpretations of, or reactions to, SWSD reveals a contested disease category which is not universally accepted in the sleep science/medicine community. Many respondents considered sleep and performance problems to arise due to gene-environment interactions in susceptible individuals. Social or lifestyle factors were implicated in the origin of the problem as much as biological factors and SWSD placed under the rubric of 'occupational disorders'. There were five main 'solutions' or 'countermeasures' to manage shift work sleep problems discussed by respondents: prescription medications; behavioural sleep medicine programmes; education; behavioural changes; changes to the shift work environment.

On the most part, modafinil was clearly understood within a medical framework as a treatment for the relief of suffering, regardless of how the disease definition was interpreted. An overwhelming majority of respondents agreed that treatment via prescription medication would be necessary or beneficial for at least some shift workers, or in combination with other non-pharmacological measures, in light of the current shift work context and information presently available. Overall, regulation of

sleep and cognitive performance in the shift work population was conceptualised as under responsibility of the medical profession, if the individual shift worker finds that they cannot cope with working shifts and are unable to successfully implement lifestyle changes. Pharmaceutical use by shift workers was, in the main, controversial within the sleep field and seen publicly as a 'last resort' or temporary measure until more scientific knowledge and technological aids are available to optimise the health of the modern workplace environment.

Illegitimate uses and imagined users

Although the dominant configuration of modafinil led to it being understood as a medical treatment and positioned as such within society, respondents did acknowledge alternative ways in which the drug could be used. However, these readings of the technology were generally positioned as illegitimate uses of the drug and referred to as 'abuse' or 'misuse' of prescription medication. In this section the focus is on how, through scientific understandings of sleep, cognition and society, modafinil was constructed as a medicine, not a food, a recreational drug or a performance enhancer.

Modafinil is not a food

Respondents reasoned that if a drug is shown to be non-toxic and it is not considered harmful in any way, then there is no reason why it should not be available on the supermarket shelves, much like other foodstuffs or health products. However, modafinil was not configured in this way. It was understood to be a powerful and potent medicinal drug with clinical applications demonstrated through scientific research and clinical trials. Respondents argued that modafinil is not a food: it is a medicine and so should be regulated and treated as such. In the account below this technological script is revealed. The respondent describes how modafinil is not a food because it was designed and developed as a medicine. Furthermore, the respondent

argues that modafinil should remain a controlled medicinal product due to the potential that its use could have serious side effects.

> "… it's not an apple, it's something we developed for this purpose that has the potential to have serious side-effects…So absolutely modafinil and like substances should be prescription...the function of having prescriptions is when we're concerned about substances interacting to produce bad health, that there's a system in place to watch. And that's okay, and modafinil should rightly be under that rubric…" (Edward, Clinician)

When considering how modafinil might be used outside of the clinical encounter, respondents regularly compared modafinil to caffeine. Often the wake-promoting and performance enhancing effects of modafinil were likened to drinking coffee or the consumption of other caffeinated products. Respondents also voiced fears over the dangers of caffeine consumption and referred to this too as a drug that is no more natural than modafinil, a drug which has strong physiologic effects and is both addictive and widely abused in many cultures. It was argued that if modafinil was to be available in the same capacity as caffeine, it would indiscriminately promote the idea of performance enhancement and it too would be abused. In the data extract below, the respondent differentiates between medicinal use of modafinil, in this case to treat children with ADHD and use of the drug by both adults and children without disorders for the purposes of performance enhancement. Whilst medical use of the drug is viewed as acceptable, its use to sustain wakefulness in a non-medical context is framed as abhorrent.

> "Should anybody who wants to stay up take it? That seems a little extreme and yet that's what people do if you make anything available. Look how we abuse caffeine, it is the most heavily abused drug in the world. Well it is a food so we think 'oh that's just cute, that's fine'. It is not cute, it is not fine, we have got children on the damn drug in huge quantities…I do not think we should be using

wake promoting drugs for children…I am not telling you about ADHD, I am just

talking about lifestyle, but I could show you newspaper ads in America that

make a positive point about waking up a pre-pubescent girl at 3.45am to

practice ice-skating so she can be an Olympic champion. I consider that an

abomination." (Bernard, Sleep scientist)

Some respondents questioned why it is legal and socially acceptable to sustain

performance under conditions of sleep deprivation through caffeine, conceptualising

this as 'performance enhancement' and as a practice that can have serious health

impacts. Respondents also regularly defended the availability of caffeine due to the

fact that it is has been available for so long and its use is embedded in cultures all

over the world. By comparison modafinil was considered a novel technology with

many unknowns associated with it usage both in the short term and over longer

periods. All thought that modafinil should not be available over the counter like

caffeine is because it is too strong a drug, it has been shown to have medicinal

properties, and although it might not be biologically addictive it could be socially

addictive, lead to major societal changes and could easily be misused. Essentially,

respondents thought that modafinil should be regulated and controlled due to fears

that people will abuse the drug which could negatively impact on individual and

population health.

"[modafinil] is a relatively new drug, caffeine has been around since the year

dot– probably if it was introduced now it would have the same kind of

classification system as [modafinil]. I think the jury's still out on [modafinil] so

my feeling would be that it's probably best avoided until we know absolutely

much more about it and I think it's use should be very controlled" (Lin, Clinician)

One respondent considered the idea of pharmacologically manipulating sleep to be a

uniquely Western desire. Again, comparing the use of modafinil to promote

wakefulness with the use of caffeine for the same purpose, she gives a slightly

different appraisal of the drug to most, reasoning that the availability of another such substance will probably not have too much impact on society.

"If you're talking about Western society, in some sections of society you'll see that people will start to use more and more to get ahead in life and that creates a pressure for other people to do the same thing…But there will be other societies where this will not likely happen…we are already doing so many things to get the maximum amount of wakefulness out of the day that a drug extra here and there to make that possible isn't going to make all that much of an impact, because we're already doing that with caffeine and similar substances anyway. So I'm not too worried that the impact will be profound but it will be noticeable" (Fay, Sleep scientist)

Modafinil is not a recreational drug

Often respondents imagined scenarios where modafinil might be used as a substitute for other substances, both legal and illegal, that are used recreationally for performance enhancement or pleasure. Despite fears over the potential for modafinil to be abused and misused, respondents often spoke about how modafinil is not a recreational drug. Comparisons were drawn with illegal substances such as amphetamines, cocaine and ecstasy as well as other legal recreational drugs including alcohol and nicotine. Each of these drugs were differentiated from modafinil on the grounds that modafinil does not give the user any kind of high, and biologically speaking, addiction potential has not been demonstrated thus far.

"I think what scares people is the high, you don't get that with modafinil…"
(Edward, Clinician)

Respondents maintained that modafinil should be used only when it is needed, often struggling to think of situations in which a recreational dose of modafinil might be

justified instead of a change in behaviours. Comparisons were drawn with other drugs, such as sleeping tablets and Aspirin, that are readily available over the counter to argue that people might end up taking wake-promoting drugs for granted and using them as a substitute for sleep. Ethically, the issue of autonomy was raised with respondents questioning whether individuals should be allowed the freedom to choose whether they take a recreational dose of modafinil. All respondents thought that modafinil should not be available recreationally on the grounds of population health and the wider impacts this drug could have on individuals, families and society more generally. Mandate via medical prescription was again positioned as a good way to ensure that only those who need the drug have access to it while at the same time reducing the risk of it being abused.

> "I'm a supporter of drugs when you do need them but I think there's too many people taking them for granted…you might have an headache and people just take an Aspirin every single day, so that's going to increase this habit of people recovering with a drug instead–maybe to mandate it on prescription would be better to avoid the pill when you don't need it. I'd need to be convinced you need it, if it's just to go clubbing and you're sleepy you can just come back earlier!" (Gemma, Sleep scientist)

Respondents found it difficult to predict what the impact of modafinil on society would be. Some imagined that perhaps it would come to be used like alcohol and caffeine and on the most part be managed by society. Drawing on past experiences and through reference to how other substances are used to similar effect, fears were raised that widespread availability would lead to abuse of the substance and related problems. Potential impacts of uncontrolled availability of modafinil were imagined, and fears raised about the unknown health implications that cutting back on sleep could have in the long term. Others voiced concerns about the addiction potential of the drug, this time on a social or psychological level.

"…given what I said earlier about the function of sleep, you'll pay for that eventually I think…these patients will present to the healthcare system but with other forms…whether you call it burnout, whether you call it problems with the heart, exhaustion, fatigue, whatever it would be, I think this will surface again in another form." (Lin, Clinician)

Despite concerns over health impacts and social changes, most respondents thought that recreational abuse of modafinil was bound to happen with increasing prevalence. Occasionally, respondents told stories of the ways in which modafinil is already being used outside of medical control to promote alertness and improve cognitive functioning.

"…people [taking something] trying to cut back in their sleep because of the pressures of life…that's what's going to happen. There's no question. They tell you that in the US there's these morning shows on television and apparently they all take modafinil because they're getting up at 4am and they have to be functioning by 6 and they feel like crap so they take modafinil and they function and they get through the show." (Dan, Clinician)

One respondent was more cautious about referring to non-medical use of modafinil as 'abuse' of the technology. Instead he preferred to think of this in terms of misuse-however, it was still considered a use of the technology by the wrong people for the wrong reasons.

"…we have graduate students and medical students who abuse modafinil so that they can basically squeeze more hours out of a day of study and work…I think some people would argue with the word abused because that has a very medical, physiological kind of implication and many people would argue that modafinil isn't abusable, you don't become addicted to it, you don't get

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tolerance and withdrawal effects and things like that. But I think it is easily

misuable if that makes sense?" (Charlie, Clinician)

In addition to fears surrounding how widespread recreational use of the technology

could be detrimental to both the individual and society, some respondents spoke

about the promise and hope embodied in this drug. Essentially, the allure of wake-

promoting drugs lies in their potential to offer the user more time in consciousness.

"…if we could develop a pill that does whatever sleep does, so now you could

run 24 hours and there's absolutely no evidence that in the long-run it promotes

disease, wouldn't the temptation be overwhelming to do it?…I want to live as

long as possible and being unconscious is not living" (Edward, Clinician)

However, respondents warned that it has not been demonstrated that prolonged or

regular use of modafinil is not harmful; pointing out that the drug does not give the

user everything that sleep does. More research into the functions of sleep was thought

to be essential before unrestricted access to the technology could even be

contemplated. There was a general scepticism that a drug that could mimic sleep

would ever be developed and that in the future there would be a safe and effective

pharmacological substitute for sleep.

"…there's lots of things that we would be denying ourselves if we denied

ourselves sleep, and that's kind of the extreme horror story of everyone in the

whole world now deciding that they can go two or three weeks at a time before

they have to sleep, cos they can all get through with drugs. I think that would

have very serious problems…I find it very hard to believe that we could have a

drug that would faithfully mimic all of that that goes on when we sleep… I'm not

sure whether we would ever be able to replace sleep" (Charlie, Sleep scientist)

Again, looking into the future respondents imagined what might happen if scientific research finds that taking a pill to promote wakefulness is not harmful in the long term. This would effectively eliminate many of the scientific and medical reasons given for controlling wake-promoting technology. Although this scenario was thought improbable in light of present scientific understandings of sleep respondents did not exclude the possibility that this could change at some point in the future. If the extension of wakefulness and shortening of sleep is demonstrated to be benign in the long term, the availability of this type of technology could provides us with a choice to chemically control when we are awake and when we sleep.

"I think it will be interesting to see if another choice becomes [available] if we can actually chemically choose when to be awake and when to sleep …"
(Karen, Sleep scientist)

Modafinil is not a performance enhancer

Respondents were familiar with claims that modafinil could be used as a performance enhancing drug. Whilst acknowledging the enhancement potential of the drug, several respondents also raised doubts about the utility of the drug as a cognition enhancer. Sleep was referred to as 'the ultimate performance enhancer' and by means of comparison the efficacy of drugs such as modafinil was brought into question.

"What we don't know is exactly in what circumstances [modafinil] does help cognitive function. One of the great hopes for modafinil was that we would be able to take it when we're sleep deprived…our ability to cognitively function would be completely intact and would have no effect of sleep loss. And modafinil while very promising in that area, it isn't quite the golden nugget that I think a lot of us hoped that it might be…I've done research studies myself where we give modafinil to people and it has almost no effect at all." (Charlie, Sleep scientist)

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It was regularly assumed that the demand for effective cognitive enhancers would be high. Students were one particular group that were often imagined as potential users of cognition enhancing drugs. Through their own experience of student life, some respondents compared modafinil use to the use of amphetamines as performance enhancers around exam times. Others spoke about the use of caffeine pills by today's students to argue that the student population already purse means of performance enhancement through pills and to some extent, always have done.

"…when we were college students people used to take things called purple hearts about two months before exams, they were amphetamines. How does modafinil compare with amphetamines- is it used by the student population?" (Jane, Sleep scientist)

A minority of respondents thought that, in the future, acute non-medical use of drugs such as modafinil could become acceptable in the student context, if they were proved safe enough to be made freely available without prescription. Through the availability of wake-promoting technology normal sleepiness was turned into a potential target for pharmaceutical intervention (Williams, 2008a). This type of use was compared to the use of painkillers such as Aspirin or Paracetamol to get rid of headaches or overcome the effects of excessive alcohol consumption.

"…if I have an exam to sit and there is limited time and I think that for me it's important to sleep very little but still be functioning, yes, I might think 'ok in this case it's right', why not use it if there's no problems? But I don't think it's right on a regular basis…It's like saying 'I drink alcohol every night and then in the day I take paracetemol to not to have a hangover'. One night is ok but if you do it everyday I don't think it really helps." (Isobel, Sleep scientist)

Fears were raised around how the unrestricted use of modafinil to curtail sleep and enhance performance might impact on society, for instance, that it could potentially

lead to longer working hours becoming the norm because people can function for longer periods of time. However, there was still a degree of scepticism the drug would be proved safe enough for OTC use and its future use in the student context only agreed to provided that more was known about the drug in respect of its safety, and other effects of sleep loss. As illustrated in the data extract below, respondents were often very clear to point out that modafinil is not a performance enhancing drug, it is a medication that does have adverse side effects.

"…modafinil itself is not a performance enhancer. It is a wake-promoting agent and it's non-addictive. Almost 20% of people report headaches after taking the drug and there is more data coming out about its longer term psychological effects. So, one should be very cautious about using medication for lifestyle issues" (Mas, Clinician)

Despite this, when thinking about modafinil use by professional athletes; modafinil *was* typically labelled as a 'performance enhancing drug'. Although some respondents did convey a degree of sadness that the drug could be used for the purpose of 'doping,' the majority of respondents expressed a lack of interest or knowledge in how the drug could be used or was being used by athletes. The use of the drug by athletes in the context of sport was clearly differentiated as outside of the boundaries of their professional expertise and many were reluctant to speak about it.

"These are issues that need to be negotiated, but to me I don't count those as relevant…what professionals in sport are doing [is] a bit of a peripheral issue for me. I don't really care so much, it's not my job to judge these people or say what they should do…" (Fay, Sleep scientist)

Overall, most respondents were cautious of the use of modafinil and like substances for performance enhancement. Typically, this type of use was referred to as 'abuse' due to perceived potential for adverse health consequences. The potential for abuse

or negative impacts of drug use to the individual and for society, in both the short term and longer term, were thought to outweigh the potential benefits of allowing modafinil to be available to all in society at present, thus reinforcing the need for it to remain under control and supervision.

In the main, the use of modafinil to pharmacologically enhance cognition by those without clinical disorders was constructed as improper use of the technology. Respondents were sceptical that modafinil would be an effective performance enhancing technology despite often acknowledging that the production of drugs that will act to further control sleep and enhance cognition is a goal shared by many in the pharmaceutical industry.

"…all these companies are after cognitive enhancement and I am not talking about just several of them, I mean all of them and that's all in this industry…" (Bernard, Sleep scientist)

To summarise, demand and desire for non-medical use of modafinil was assumed to exist across all sections of society. In comparisons with caffeine and other food stuffs respondents explained how modafinil is different: it is not a food and therefore should not be openly available to all on the supermarket shelves. Drawing attention to other legal and illegal substances that are currently used recreationally, for performance or pleasure, modafinil was again differentiated. Although it could well find a role in society as a recreational drug to promote wakefulness and control sleep, scientists struggled to endorse this type of use on the grounds of potential health impacts. Again, the technology was understood as a potent medicinal drug that can be used to treat sleepiness- but not to stop or replace sleep. Scientists and clinicians often made it clear that non-medical use of the drug for purposes other than treatment was outside of their professional expertise and they were uncomfortable talking about these uses. The potential for modafinil to be used as a cognitive enhancer was acknowledged. However, drawing on scientific research, many of those interviewed were personally

involved in, the efficacy of the drug for this purpose was openly questioned. Respondents spoke about the allure of cognitive enhancement but were highly sceptical that we would ever be able to pharmacologically mimic sleep and reproduce its effects on cognition.

Summary and conclusions

In the scientific and medical discourse sleep and other cognition functions were conceptualised as brain-based processes. Despite giving accounts of sleep and wakefulness as being under biological control, respondents did not take a reductionist or biologically deterministic view. Empirically, biological, psychological, socio-cultural and environmental factors were taken into account when discussing the relationship between sleep, cognitive performance and health. Respondents acknowledged the importance of social and cultural factors in the origin of sleep problems arguing that the way we live our lives in today's world may contribute to the onset of some of these problems and the conceptualisation of them as problems in the first instance. Respondents spoke about sleep disorders as being comprised of many different elements, often referring to them as irreducibly biological, psychological and social in nature. Therefore, sleep disorders do not easily fit into a traditional medical model where diagnosis of a disorder necessarily leads to medical (or pharmacological) treatment.

However, sleep deprivation was constructed as a social problem that can have huge impacts at both the individual and social level. It was argued that sleep disorders, sleep deprivation and impaired cognitive performance become significant when they impact upon the ability of an individual to negotiate the demands of their everyday life; in the home and in the workplace or if impaired performance impacts on the wellbeing of others. However, such problems only become clinical problems when the individual complains of a problem and seeks medical help.

Much of the data presented focuses on the case of SWSD, a relatively new construct that is still somewhat under debate within the sleep science and medicine community. Through this case in particular, the complex bio-psycho-social framework used to explain sleep disorders in the scientific discourse was most evident. It was proposed that biological factors may predispose an individual to react negatively when immersed in a shift work environment. Sleep problems and cognitive impairments associated with shift work were, in this sense, given a physiological basis and located inside the individual; inside the brain and body. However, scientists and clinicians explained that an individual would be diagnosed with SWSD because of an incompatibility between their biological make-up, socio-cultural working patterns and psychological disposition without labelling their biological make-up as 'abnormal', deviant or pathogenic.

It was apparent in the data that, to some extent at least, sleep is being medicalised with the emergence of SWSD. However, it was also clear that such medicalisation is controversial within the expert community. The variety of interpretations of and reactions to SWSD in the data reveals a contested disease category which is not universally accepted. Resistance towards the medicalisation of shift work was also evident in various forms throughout the data. Some respondents gave partially medicalised accounts of SWSD and others non-medical accounts, whereas in some cases the tension around this issue was discussed outright. In this sense, the sleep science/ medicine communities could be seen as providing a form of resistance or obstacle for the further medicalisation of sleep, rather driving the process forward (Dingwall, 2006).

Despite this area of contestation, all respondents agreed that shift work is a lifestyle that comes with health consequences, that impact at various levels. Shift work was constructed as a 'pathologic' environment through discussion of the heightened longer term risks of developing serious health problems. Cognitive impairments associated with sleep deprivation were framed as a significant problem in the shift work

population, posing a danger to the physical, mental and emotional wellbeing of the individuals and also impacting on wider society through an increase in workplace accidents and mistakes.

The conceptualisation of SWSD as a legitimate medical condition with a genetic or physiological basis allowed for treatment via medical intervention to be proposed and shift workers to be configured in the role of patient. Here, similar rhetoric to other 'patient uses' was found through which modafinil was configured as a medication for treating sleepiness, a way to relieve suffering and help those in distress. Pharmaceuticals were viewed as valuable short-term measures to treat the symptoms of SWSD. Resistance to the pharmacological treatment of at least some shift workers was scarce in the data. Only two respondents thought that under no circumstances should shift workers be treated pharmacologically. Their reasons for this stance drew on future-orientated discourse, raising fears surrounding a proliferation in the use of medication to promote alertness which could lead to adverse health consequences in the future. All respondents agreed that modafinil should be a controlled substance, used under the supervision of medical professionals who would assess each individual on a case-by-case basis prescribing medications to only those who really needed them.

As an aside to this, it is worth noting that future-orientated discourses describing a technological revolution in the workplace featured strongly in the data and in a sense made the debate about whether shift workers *should* be treated for sleepiness (or not) seem almost irrelevant. If the visions of technological solutions (e.g. human-machine interfaces) to ensure a happy, healthy and alert workforce are soon to be realised, the discussion about whether or not to medicate shift workers will be rendered obsolete.

Overall then, modafinil was configured as one of several pharmacologic and non-pharmacologic treatments for the symptom of sleepiness associated with numerous clinically defined disorders, be they to do with sleep, other medical disorders, lifestyle

or behaviour. Modafinil was positioned alongside other medical technologies (mechanical devices and other pharmacologic substances), behavioural therapies and lifestyle changes as one of the many means currently available to help individuals suffering from excessive sleepiness/ impaired alertness. The underlying cause of the problem, patient choice and the availability or success of other lifestyle interventions were often raised as important factors in deciding how to treat sleepiness.

The majority of respondents situated pharmaceutical technology as a 'last line of defence' or 'last resort' to be used when considered to be the most effective option available, if the individual was unable to change their lifestyle or if other non-pharmacologic measures had failed to produce sufficient changes. The most important issue was not whether there was a 'real' disorder located inside the body, but how effective and appropriate an intervention would be to deal with the 'complaint'. This is decided between medical professionals and patients in the context of their daily lives and personal preferences (Tomnes, 2007). Therefore, it appears that medicalisation at a definitional level does not necessarily lead to justification for pharmaceutical therapy in the scientific domain as was observed in the media discourse.

Occasionally, however, the role of modafinil was configured not as medical treatment but as safety tool for those without clinical disorder, as described in the case of acute use in extreme situations which require alertness and high levels of cognitive performance. This type of use was debated by sleep experts; some justified such applications based upon potential societal benefits whereas others discounted the idea. However, in the scientific discourse medicine did maintain rhetorical authority over the drug, even in absence of clinically defined illness, as the drug was still understood and positioned as a medical technology that should be under medical control, prescribed on the discretion and under the supervision of a medical professional. Fears were raised in relation to the potential harms that could be induced at a biological level by using a drug in the absence of illness to go without sleep. On a wider social level concerns were raised about the possible proliferation of non-clinical

use of the drug which could lead to social dependency, health problems and an over-medicated population.

Acute use of the drug in emergency situations for safety reasons cannot be clearly defined as therapy or enhancement, instead straddling the boundaries between the two. It can be considered therapeutic from the medico-scientific perspective on the basis that it is a medicine that is prescribed by medical professions to correct or prevent cognitive impairments due to reduced sleep in order to promote individual health and safety and the health and safety of others. On the other hand, it can be considered an enhancement on the grounds that the drug would be consumed in the absence of clinically defined disorder to counter a normal and natural human state, and thus would boost individual performance beyond a normal level. Interesting questions arise here regarding the social role of medicine. For if health is held as the ultimate goal for human existence, is the protection from harm or ill health a goal of the medical enterprise? And if so, does the acute use of psychopharmaceutical drugs such as modafinil fall under the jurisdiction of medicine or go beyond? Further to this, does drug use go 'beyond therapy' if the substance is prescribed and controlled by medical professionals but used for non-clinical applications? These questions will be considered in light of the analysis of prospective users views (Chapters 6 and 7) and returned to in Chapter 8.

In the scientific discourse overall, modafinil was clearly defined as a medicine. Reading the technological script of modafinil in this way acted to exclude other possibilities of use outside of the medical encounter. It was made clear that modafinil is not a food; so should not be freely available to everyone on the supermarket shelves. It is not a safe and effective cognition enhancer, or a substitute for sleep and taking the drug is not risk free. It was argued that modafinil should only be used as a medicine when it has been prescribed to those that really need it, in a controlled and supervised way via the mechanism of prescription. Through the configuration of modafinil as a prescription medication the identity of the user was also constructed. In

scientific discourse users take their place within this cast of roles as patients (Akrich, 1992). Further to this, parameters are set which attempt to define and delimit the users' possible actions (Woolgar, 1991) where only certain forms of use are encouraged. In this case modafinil should only be used as a medicine when it has been prescribed as such during a clinical encounter by a medical professional.

Although the dominant configuration of modafinil led to it being understood as a medical treatment and positioned as such within society, alternative technological scripts for use were readily imagined. Demand and desire for non-medical use of modafinil was assumed across all sections of society. Students, athletes, recreational drug users, children and various professionals were all imagined as future users of modafinil in their attempts to control sleep and enhance performance in everyday life. However, sleep scientists and clinicians readily defended their reading of modafinil-as-medicine and were highly sceptical that the drug would work as a cognitive enhancer or that it would be safe for consumption without medical guidance. The data therefore illustrates the strong cultural power of medical authority in defining and delimiting legitimate spaces for drug use in modern society.

Visions of the past and of the future regularly guided responses in this domain. Some respondents drew on stories of drugs that were once thought to be safe but later turned out to have adverse consequences to argue that modafinil use by those without illness should be approached with caution. Others projected into the future, envisioning how the drug could be abused, misused and lead to population health problems upstream. Scientists and clinicians alike referred back to the science of sleep and reasoned that, at present, the scientific community does not have the evidence available to say what the effects of extended wakefulness over a long period of time might be. On these grounds respondents found it difficult to endorse non-medical uses of the drug.

Only when science understands more about what sleep is for, how drugs such as modafinil actually work, and what the long-term of effects of prolonged wakefulness could be, might the use of a technology to pharmacologically control sleep and enhance cognition among otherwise healthy individuals be endorsed by the scientific community. For now, modafinil is understood a medical treatment, that is strong, largely safe and effective for use in clinical applications.

Chapter 6: Imagined uses of modafinil in the workplace

<u>**Introduction**</u>

As discussed in Chapter 1, the importance of the context in which psychopharmaceuticals are prescribed or bought and used is acknowledged by some academics involved in neuroethical debates (Sahakian & Morein-Zamir, 2007; Racine & Forlini, 2009). However, to date there is a lack of empirical evidence on this front with most debates referring to limited survey data (see: Nature, Jan 2008) or drawing on anecdotal evidence to discuss whether we 'ought' to enhance our cognitive functioning (e.g. Farah, 2004; Tannsjo, 2009). Alongside neuroethical debates, there are arguments in the sociological literature relating to the medicalisation (Conrad, 2007) and pharmaceuticalisation (Williams, Gabe & Davis, 2009) of everyday life; the increasing tendency for aspects of selfhood and normality to be understood through biological and medical discourses and augmented using pharmaceuticals. This leads some to claim that new neurotechnologies not only cure illness or enhance health, but reconfigure the processes of life itself changing what it means to be a biological organism. According to Nikolas Rose (2007: 40) 'our very biological life has entered the domain of choice'.

The aim of this chapter is to analyse the ways in which prospective users of modafinil understand, position and negotiate use of the drug in the context of their everyday lives. It focuses on uses of the drug in one specific social context, the workplace, by one prospective user group, shift workers. Specific research questions addressed include: How are sleep, cognition and the body conceptualised by shift workers? How is modafinil use understood, positioned and negotiated within this social domain? What sociotechnical scripts are associated with modafinil use and how is it positioned as a medical or non-medical technology? According to what norms do shift workers believe that augmentation of the mind should take place? What role is given to medical authority in deciding if particular uses are acceptable?

Drawing on interview data, the chapter begins by providing a detailed description of the context of shift work from the perspective of shift workers, focusing on the problematisation of sleep and wakefulness in relation to the biological body. In doing this it attempts to expose the social and political bias in some key assumptions made about this (far from homogenous) group of people in the neuroethical and media debates, after which, the different interpretations and configurations of modafinil use and users are further explored in this social context. The analysis takes into account: the society and network of artefacts within which the technology would be embedded; how potential users/ non-users 'read' the technology and its configurations; and how putative users/ non-users and the future impact of their likely actions are configured in the process (Woolgar, 1991; Akrich, 1992; Wilkie & Michael, 2009).

The shift work context

As discussed in Chapter 1, it is often assumed that in some professions at least, there is both need and desire for cognitive enhancement (Greely et al, 2008; Glannon, 2006; Farah, 2002). The 'need' for cognitive enhancement is justified in terms of dangers posed by cognitively impaired or sleep deprived workers to others in the workplace and desire is framed in terms of increased productivity and performance at the individual level. Additionally, shift work is commonly associated with a move towards 24-hour living, flexibility and choice in when and how one conducts one's life (Boden et al, 2008; Moore Ede, 1993). Psychopharmaceuticals fit into this vision as a way to remove corporeal restraints by augmentation of the biological body; a way of recreating ourselves in our everyday lives (Rose, 2007).

In the following section these assumptions are questioned through an exploration of: the conception of shift work as a lifestyle choice; the perceived impacts of shift work on sleep and wakefulness; the problematisation of workplace sleepiness; the existing technologies, rituals and routines shift workers use to control sleep and enhance cognitive functioning in their daily lives. In the following two sections how modafinil use

was understood and positioned by shift workers in relation to these findings will be detailed.

Shift work as a lifestyle choice?

Over the past two decades there has been a noticeable move towards the vision of 24 hour living in the UK (Moore-Ede, 2003). A huge array of services and facilities are now available on demand around the clock, from licensed premises to libraries. A result of the move towards 24 hour living is that more people are required to work shifts outside of the traditional 9-5 working day. It is tempting to assume that shift work contributes towards 'flexible living', providing not only consumers but workers with more choice in how and when they conduct their life. In this vision of the world, drugs such as modafinil are afforded the role of technological enhancements that allow an individual to overcome the constraints of their biology and choose when to be awake and when to sleep.

Extending the working week beyond the traditional 9am to 5pm working day Monday to Friday may provide greater flexibility for the consumer, however, it appears not to deliver this promise to many shift workers. Each of the shift workers interviewed reported no or very little control over the shifts that they worked, with only two of those interviewed voicing a preference for shift work. In general shift work was conceptualised as a difficult and *inflexible* lifestyle. As captured in the account below, most respondents would not choose to work shifts if they were not required to in their profession due to the negative impact it was perceived to have on their work-life balance and individual well-being.

"I wouldn't say I do [enjoy working shifts]. I do [see benefits], but I think they're far outweighed by the cost for me…the effect on family life, social life, not being able to do things that I enjoy doing...exhaustion as well" (Hamish, Medical doctor)

Theoretically, modafinil could pose a technological solution to these problems of work-life balance by providing the user with more time awake and alert outside of the workplace for social engagements. However, this would require shift workers to forsake sleep for prolonged wakefulness. The desirability of this will be returned to later.

Constructing sleep and wakefulness

The social phenomenon of shift work has a direct influence on when, where, and how people sleep (Ekrich, 2001). In this section the ways in which sleep and wakefulness were talked about by shift workers will be explored with emphasis on how such representations act to construct shift workers bodies in relation to cultural conceptions of what they consider to be normal. All respondents thought that sleep was important, although most admitted that they had not really thought much about why we sleep and what sleep does before the interview. Although not at the forefront of their minds, sleep was constructed as an essential part of everyday life, a period of time for the body and brain to rest. As illustrated in the data extract below, it was valued highly and thought to be essential, good for and needed by the body, providing the energy required for physical and mental functioning during wakefulness.

"I think it's very important, you need sleep so you can get through the day, it's what the body needs, it's got to have sleep…I think it's very good for you." (Mo, Postal worker)

Sleep and wakefulness were understood as two discrete states of consciousness. In this view, when asleep the individual would be temporarily 'gone' (Paul, Factory worker) until they awoke. Functionally the role of sleep was understood through personal experiences of the effects of sleep deprivation in respondents waking lives. Lack of sleep was perceived as impacting on the body, psychology and performance in various ways. The physical impacts of sleep deprivation on the body were described

as 'terrible' (Toby, Airport worker) or a 'nightmare' (Kim, Nurse). Respondents linked lack of sleep to health problems both now and in later life, reporting that sleep deprivation lead to them feeling ill, shaky, tired all the time and exhausted. This was perceived by one respondent as the body's way of telling them it cannot go on without sleep (Hannah, Support worker).

In the main, the psychological and emotional impacts of lack of sleep were emphasised in shift workers accounts. Respondents reported lack of sleep making them feel mentally tired, slow, groggy and fuzzy; snappy, cranky, irksome and irritable; overly emotional and being down or low in mood. Respondents saw these psychological and emotional impacts of sleep loss as transforming their personality. Some went as far as to say that without enough sleep they are not their 'normal self' (Hannah, Support worker), in some cases turning into 'not a very nice person' (Paul, Factory worker). Additionally, the physical and emotional effects of lack of sleep were thought to negatively affect interpersonal relationships; lead to errors and mistakes in the workplace; diminished performance at work; and accidents on the roads.

It was thought that when one works shifts their sleep pattern is disrupted and becomes unstable and this was seen as 'the norm' for many people. This disruption was described as 'hard'; 'horrible'; a 'shock'; a 'killer' and 'not very good' for the individual (Toby; Kim; Mo; Karolina). Respondents reported 'forcing' (David, Medical doctor) themselves to sleep in the day or staying awake for up to forty-eight hours at a time before 'crashing' (Hamish; Matt). Others said that under specific circumstances (when changing from day shift to night shift for example) over a twenty-four hour period they would probably get very little if any sleep. The effects of shift work on sleep patterns were typically described through biological understandings of the body. For example, respondents often discussed how their body clock was 'out of sync' with their shift pattern. This was especially the case in accounts given by rotating shift workers (see data extract below) who thought that the constant change in the timings of their shifts

made it difficult to get into a 'proper pattern' of sleep and wakefulness, making them feel 'tired all the time'.

"I don't sleep very well in the day and when I am back on a day shift a day later and I feel really tired because I have not got back into a proper pattern" (Karolina, Nurse)

In the absence of normative advice or cultural cues relating to sleep timing (for example, notions of bedtime, it being late or early) for this population some shift workers felt unsure about when they were supposed to go to sleep after a shift. This confusion is evident in the data extract below where an airport worker is talking about when he sleeps after working a night shift:

"If you come home from work in the morning at 6am, do you go to bed straightaway or do you stay up and then go to bed? And when you do go to bed straightaway, you wake up fairly early and then it's like you haven't slept. If you go to bed later, you wake up later, but you still feel as though you want to go back to bed." (Toby, Airport worker)

Most respondents perceived themselves to have little control over how long they slept for. Several respondents said they would like to get eight hours sleep per night but usually got somewhere between five and seven. Eight hours sleep was commonly referred to as the 'recommended', 'right' or 'full' amount of sleep the body needs. However, most thought that five to six hours was enough sleep for them on a regular basis, sleeping longer on days off and taking naps to 'catch up' or get some 'extra' sleep. It was regularly stated that shift workers do not sleep well although this seemed to be taken for granted. Conceptualising normal sleep as a 'solid' period of time, shift work was thought to result in 'broken' sleep. This 'broken sleep' was thought to have more of a negative impact on the way the individual felt rather than changes to sleep duration or timing.

"I would rather have 4 - 5 hours good sleep than I would 8 hours broken, because I find that if it is broken sleep it doesn't matter how long I have, I still feel as tired. So always count myself as a good night's sleep is 4 - 5 solid hours…" (Karolina, Nurse)

Implicitly, through the normative aspects of shift workers accounts we uncover the message that normal sleep should be an unbroken period of time, ideally seven to eight hours in length, during the night. One should wake up after this time and stay awake all day, until the same time the following night when it is time to go back to sleep. This stable pattern of uninterrupted sleep and wakefulness is how we should behave and how our bodies are designed to function. Shift work disrupts sleep at all of these levels. Shift workers (especially of the rotating type) cannot follow a set pattern of sleep and wakefulness. They cannot sleep for the recommended duration and are confused as to when it is the right time for them to sleep. Shift work results in broken sleep which affects the body, emotions, personality and performance. This is somewhat at odds with the scientific discourse, which points towards an understanding of sleep and wakefulness as on a continuum rather than discrete states and sleep timing, duration and efficiency as individual, influenced by social, psychological and biological factors. The importance placed on sleep by shift workers and their perception of sleep as a biological need brings into question the desirability of the technological extension of a wakeful state. This point will be returned to in greater detail later on.

Problematising workplace sleepiness

In a recent study Kroll-Smith & Gunter (2005) argue that somnolence, once considered a benign state of being and a naturally occurring corporeal precursor to sleep, is increasingly being represented as a potentially hazardous and morally reproachable problem of public concern. Workplace somnolence was something which all of those interviewed had experienced at one time or another. However, the

way in which this behaviour was constructed differed between respondents and was related to their occupational role.

In doctors' accounts workplace sleepiness was not problematised or seen as morally reproachable. Instead this behaviour was thought of as to be expected and controlled through formal institutional mechanisms and practices. Neither of the two doctors interviewed disclosed that they had unintentionally fallen asleep in the workplace. They reported sometimes feeling 'out of it' or 'all over the place' (Hamish, Medical doctor), getting tired, struggling and finding it difficult to stay awake, their motivation waning when working nights or nearing the end of long days. In these instances, if it was not busy they would go to a specific space in the hospital designated for their use in these situations. They would be able to lie down on a bed in a darkened and quiet room, put their head down, and close their eyes. During this time they would be able to rest and sleep, referring to this as taking a 'powernap' (Hamish; David). They reported carrying an electronic pager which would 'bleep' and wake them up if they were needed back on the ward. The consequences of falling asleep unintentionally whilst working were conceptualised as potentially 'disastrous' or 'catastrophic' (David, Medical doctor) in terms of posing a danger to patients' lives. Both thought this would be unlikely to happen due to institutional practices and technologies that are in place such as alarms and other people around who would wake them up, which act as 'safeguards' (David, Medical doctor).

Both the retail staff member and call centre operative reported that they had not fallen asleep at work but had felt very tired and sleepy, especially after a late night or when it was warm and not busy. Both had witnessed colleagues falling asleep at work and thought that if they were to fall asleep at work for a short period of time it would not be 'a big deal' (Alan, Retail staff), that their colleagues would probably find it amusing and give them 'a shake' to wake them up (Edie, Call centre operative). One respondent reasoned that workplace sleepiness is understood as 'everyone is in the same boat' and when it is not busy in the workplace one does not have to stay alert as there is not

as much work to do. In these occupations shift workers are not directly responsible for the safety of others and falling asleep at the desk does not pose the same dangers as falling asleep at the wheel of a car or in the operating theatre. Workplace sleepiness was not problematised by these respondents.

Like the doctors interviewed, the two nurses interviewed reported taking time out to sleep during night shifts. In stark contrast to the doctors' accounts, workplace sleepiness was identified as an extremely problematic and morally questionable behaviour in nurses' accounts. In particular, the difficulty that nurses face in staying awake during the night shift was discussed. In the accounts they gave it was acknowledged that even though officially nurses are not supposed to sleep at work during 'waking nights', this is an ideal that in reality, is often not achievable. Both respondents reported that nurses working a waking night would often be allowed by their ward manger to take a nap on their break; or for a longer period if the ward was quiet to give them a rest. They would lie down on one of the empty beds used by patients or in the staff room by putting two chairs together. Other nurses would be around and often the environment would be light and noisy. The informal practice of taking time out to sleep was justified through appeals to the biological body and the 'body clock' with respondents arguing that although nurses do 'struggle' (Kim, Nurse) to stay awake, those who do not work permanent nights are 'not on a night shift body clock' (Karolina, Nurse) so cannot keep themselves awake during breaks. Informal institutional mechanisms (e.g. other nurses would monitor time asleep and wake the individual up after their break) were also in place to ensure that the individual woke up as soon as they were needed. However, this practice was seen as strictly off-the-record and not following official policy. Sleeping during working hours, even if one was on their break, was understood as illicit behaviour that was breaking the rules of the profession and it was feared that if they got caught sleeping at work that they would be disciplined.

Five respondents, a postman, a mental health support worker, a police officer, an airport worker and a machine operator in a factory, reported that they had felt excessively sleepy in the workplace but had not fallen asleep at work. They reported feeling 'tired'; 'dozing'; 'loosing concentration'; 'shutting off'; going onto 'autopilot'; finding it 'hard' or 'agonising' to stay awake after a long day or during the night. One respondent reported regularly falling asleep on the bus on the way to and from work (Toby, Airport worker). For these respondents, the consequences of falling asleep at work were conceptualised as 'dangerous' both for them professionally by leading to them losing their jobs; but also posing a danger to others by putting their lives at risk through negligence or causing accidents. Several told scare stories of colleagues who had fallen asleep at work, been 'caught' and had lost their jobs.

"It is pretty dangerous and I am sure I could lose my job if I got caught…I know a couple at work that have fell asleep before…one was woke up by a team leader, so he was sacked." (Paul, Factory worker)

In one account, going to sleep during work hours was thought of in terms of deception. In the account below a postal worker is talking about how he thinks some colleagues take time out to sleep arriving back at work to make it look like they have done a full day's work when they have not. The worker is paid to work for a specific time period and when asleep one is not working.

"I think some people do [go for a kip] in the vans once they've delivered the bags and boxes for the postmen...about 8, 9am, then go back to work later on so, obviously, looks like they've done a full day and they haven't." (Mo, Postal worker)

Others imagined what might happen to those whose wellbeing they were responsible for if they were to fall asleep and used this to argue that in some professions, where one is responsible for the safety of others one simply cannot fall asleep at work.

"Probably get the sack…because you're working with vulnerable adults and you've got to do 15 minute observations, so you're responsible, if they killed themselves and you weren't watching at specific times, then –yeah, so, can't fall asleep" (Hannah: Support worker)

The ways in which shift workers manage this disruption to sleep/alertness is discussed in the next section.

Technologies, rituals and routines

Despite much information being available in the public domain[33], none of the shift workers interviewed had formally been given any information about how to manage sleepiness/alertness in their occupational role. Neither had any of them had sought out this type of information from their employers or other official sources. As illustrated below, it was generally accepted that most shift workers do not get 'proper sleep' or 'enough sleep' but this is 'part of the job' and you are expected to deal with it yourself.

"…I don't think people really consider it, I think that, if you do have a problem, in regards of you're not getting enough sleep or whatever, they'd just think, well, you knew this is what the job entailed before you came on board, so you have to just deal with it." (Kim, Nurse)

Information about how to manage workplace sleepiness and post-shift insomnia was often reported to be passed through informal channels, between colleagues and friends. In this sense, sleep was seen as a private and personal domain. Respondents reasoned that people deal with sleep problems in their own ways and find ways to help themselves get into a pattern so they can sleep better. In their study on women's management of sleep problems Hislop & Arber (2004) attempt to go 'beyond medicalisation' to highlight the importance of 'personalised strategies' for managing

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[33] Much information and advice for shift workers about how to manage sleep is available in the public domain. For instance, see: http://www.hse.gov.uk/humanfactors/shiftwork/tips.htm

sleep. They argue that such strategies exist outside of medicalised strategies that are promoted in popular culture and may be indicative of the demedicalisation of particular aspects of sleep. As technologies are designed, developed and used in the social world, in order to study the prospective uses of modafinil, it is important to first uncover the web of other artefacts and activities in which its use will be embedded. In this section, the personalised strategies shift workers already use to manage sleep and alertness in their daily lives will be described, acknowledging that although perceived as private or personal, such strategies may in fact be traceable back to narratives found in popular culture (Seale et al, 2007).

Each of the respondents gave accounts of their own personal bedtime routine. Typically, this involved various aspects of personal hygiene, putting on specific bed clothes, darkening the room and getting into a bed. Some respondents reported self-medicating, using OTC pharmaceutical products, homeopathic remedies, antihistamines and alcohol as sedatives to enable them to sleep when they were finding it difficult. One of the nurses interviewed described using an OTC sleep aid to help her sleep after a night shift, justifying this action through appeal to the 'design' of her 'body clock'.

"My routine is I have to go straight to bed as soon as I get in off my night shift. Sometimes I might take things like Nytol to help me get to sleep because I find it so much harder to sleep in the day because my body clock isn't designed to sleep in the day." (Karolina, Nurse)

In addition, respondents reported reading, having a warm drink or hot bath, doing some mild exercise or watching television as an aid to 'switching off'. One respondent described how he attempted to prevent developing sleep problems in the first instance. Again in his account we can observe echoes of the cultural norms discussed earlier: that an unbroken period of sleep during the night and wakefulness during the day is normal.

"I'm more prevention rather than cure, so I will make sure that I don't go to bed during the day if I know I've got to try and get myself back to a normal nocturnal pattern. I will try and make myself as tired as possible and then wait to go to bed until I'm absolutely shattered, so I'm tired and therefore sleep all night long…" (David, Medical doctor)

All but two of the respondents reported using an alarm on a daily basis to wake them up after a period of sleep. After getting out of bed respondents described various ways to help them wake up including: having a hot shower; hot drink; energy drink; something to eat; and making their environment light and noisy. Despite such efforts, some respondents reported still falling back to sleep. Overall, respondents perceived themselves to have more control over when they awoke (albeit thoroughly mediated by technology) than when and how well they slept.

All respondents thought that being busy at work, interacting and talking with people and keeping the body and brain active, although tiring, was the most important thing to 'keep them going', awake and alert in the workplace. It was regularly acknowledged that people do use a variety of substances; both legal and illegal, to help them stay awake and alert. Some respondents reported drinking caffeinated drinks, eating sugary foods, taking caffeine pills, or smoking cigarettes specifically to promote alert wakefulness.

"Eat lots of chocolate to stay awake and drink lots of coffee and sometimes I take bottles of Red Bull and Lucozade and just hope that the patients just keep pressing their buzzers to keep us on the ball" (Kim, Nurse)

Other ways of promoting wakefulness included: taking breaks; getting a change of scenery; getting some fresh air; splashing cold water into ones face; having a shower; browsing the Internet; and watching television. One respondent gave an account of a

colleague who used illegal substances to stay awake, but stressed this was not the norm in his place of work.

"...everyone's tired but really they just keep going...they're there for the money and that's it, they don't care so long as they can get through that shift. By any means I should imagine. Some have probably taken stuff…it's probably a rarity rather than a common thing…one lad was sacked last week…found him in the toilets, high as a kite…he was taking stimulants, obviously he couldn't control them, he disappeared for hours hiding somewhere and eventually they checked the toilets, he was in one of the cubicles out of his head, so he got sacked on the spot…" (Toby, Airport worker)

To summarise, the extent to which workplace sleepiness was viewed as a problem differed according to occupational role and occupational culture. In some occupations (e.g. hospital-based doctors) technologies and other mechanisms are embedded in institutional practices which allow for and control sleepy bodies. In other occupations (call centre, retail staff) workplace sleepiness was not problematised due to the perceived lack of impact this behaviour has on productivity (as it is less busy during late or early shifts) and the safety of others. In the other occupational roles discussed, workplace sleepiness was problematised in two ways: firstly by posing a danger to the security of one's job (as when one is asleep one is not working); and secondly by putting the safety of both the self others at risk. There is a time and a place to sleep and for most shift workers neither of these is in the workplace. Although the body might be tired and one might feel sleepy, the shift worker must go against their biological clock to stay awake and alert to do their job and earn their pay or face being sacked.

Shift work sleep disorder: The power of diagnosis and labelling

None of the shift workers interviewed had heard of shift work sleep disorder (SWSD) before the interview process. When informed of the symptoms of the disorder as defined in the ICSD-2[34], a few expressed their surprise that this was recognised as a medical disorder and disappointment that they had not heard of it before. Despite this, all but one of the respondents accepted the medical definition and said they could 'understand' why SWSD would exist, with many recognising the symptoms in themselves, family members or colleagues.

Three respondents thought that this disorder explained the way they were affected by shift work. This transformation in understanding is captured in the account below. Before she was aware of a medical label and explanation for some of the sleep problems she had experienced the respondent had not previously linked her sleep problems to her job instead, understanding these feelings as normal for and personal to her. When informed that a medical disorder existed she became excited as she recognised the symptoms in herself. Immediately she reconstructed her own experiences through this medical discourse labelling herself with the condition. The normalising power of medical discourse is evident here as through the application of a medical model the boundaries of acceptable states and behaviours are reconfigured transforming the once normal into the pathological.

> "…it's such a norm to me, but thinking about it now, that the fact that I do have problems sleeping is probably related to the job…that was the last thing I thought of it being and thinking about it now, I can't believe it! That's amazing!...Oh my gosh! [laughs] Woah…I knew people can get overtired and have problems shutting off, but I didn't think it was an actual disorder… I think I've got that…I think I have, I have. Oh my God! Yeah, I think I've got it, I've had it for years…" (Kim, Nurse)

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[34] Symptoms have been identified as excessive sleepiness during working hours or in the evening and/or insomnia during desired sleep time usually lasting for a period of more than one month (Fahey & Zee, 2008)

Similarly, in another account the respondent reconstructed her experiences through the medical discourse and used this to explain why she did not cope in a previous job. She had found her sleep problems very severe and isolating. She felt that these were not taken seriously at her place of work and she ended up leaving her job and changing professions altogether. In the medicalisation literature it is argued that the application of a medical label can provide legitimacy to those living with the illness to gain medical treatment (Lee, 2006) and may also help individuals make sense of their 'symptoms' (Furedi, 2006). In the account below these positive aspects of medicalisation are evident as the respondent explains how having a medical label for the problems she experienced would have helped her to understand why she was having problems, to reassure her she was not alone and give her hope of some treatment or help.

"…that's probably why I was having trouble when I was doing the nursing. But I never knew it was anything medical…it would have been nice to know that back then, that there was something out there that people could say 'well, I could give you something, it could be this' or knowing that other people were having the same problem…It's just knowing that you are not alone out there…' (Edie, Call centre operative)

According to Lupton (2003) as individual lives and experiences are increasingly understood through the discourses and practices of medicine, power is exercised through the persuasion of subjects that certain ways of thinking and behaving are appropriate for them. Despite this, although the symptoms of the SWSD were recognised by all respondents with many experiencing the same 'symptoms', it was only in those situations where the problem was perceived as being dealt with inadequately did the respondents latch onto a medical definition to explain why they were feeling the way they were. The remaining respondents reasoned that all shift workers experience the effects of shift work and are sleep deprived to some degree and that those most severely affected or at the extreme end of the continuum are

probably the ones with SWSD disorder. Some thought that if they worked more frequent shifts then work-related sleep problems could become 'a real problem' (Hamish, Medical doctor) for them too.

According to Farah (2005: 38) 'the disease model emphasises the deterministic nature of behaviours and therefore reduces their moral stigma'. Others argue that increased awareness of a phenomenon through the process of medicalisation can help popular acceptance, boost research into the pathogenesis of the disorder and lead to improved pharmacological and psychological management (Stein et al., 2007). In this case, the availability of medical discourse to explain and label experiences as symptoms of a disorder transformed the understanding of these experiences from personal difficulties for which the individual was to blame into 'real problems' that were seen as legitimate to experience and to an extent outside of individual control and responsibility. Once seen as abnormal and biological, at least in part, these behaviours become legitimate sites for medical treatment. Nik Rose (2007) suggests that:

'a neurochemical sense of ourselves is increasingly being layered onto other, older sense of the self, and invoked in particular settings and encounters with significant consequences….to grasp the world in this way is to imagine the disorder as residing within the individual brain and its processes, and to see psychiatric drugs as a first line intervention, not merely for symptom relief but for ways of modulating and managing these neurochemical anomalies' (2007: 222-3).

The next section will explore shift workers attitudes towards the use of modafinil as a medical or non-medical intervention to 'modulate and manage' their neurochemistry.

Modafinil: configurations of technology and users

None of the shift workers interviewed had heard of modafinil prior to the interview. They were informed that modafinil is presently available via prescription in the UK as a medical treatment for the symptom of excessive sleepiness/ impaired alertness for use by those with medical disorders. The role of modafinil in the workplace was flexibly interpreted by the shift workers interviewed with use and users (re)configured in many different ways. Four main configurations of user and technology dominated shift workers accounts: modafinil as a medical treatment for shift workers; modafinil as an OTC pharmaceutical product; modafinil as a safety apparatus; and modafinil as a cognition enhancer. In this section each of these are discussed in turn and the normative aspects to each configuration explored.

Modafinil as a medical treatment

As discussed in Chapter 1, SWSD is often presented in the neuroethics literature and media coverage alike, as a legitimate medical target for pharmaceutical intervention. Similarly, all of those interviewed agreed that modafinil use by those with 'medical conditions' was acceptable if 'recommended' by a doctor.[35] Sleep problems diagnosed as due to SWSD were not differentiated from other sleep disorders in shift workers accounts. The severity of the problem was of primary concern rather than its biological or social origin. Medical professionals were thought of as experts possessing relevant medical knowledge as to when a problem was severe enough to warrant medical treatment. As acknowledged by Greely et al (2008: 704) presently medical doctors are the gatekeepers to medications such as modafinil and as such 'society looks to them for guidance on the use of these medications'.

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[35] As all but one of the respondents accepted the medical definition of SWSD, this too was viewed as a legitimate site for drug use. Even the one respondent who did question the validity of defining sleep problems due to shift work in medical terms agreed that treatment via modafinil would be acceptable if recommended by a doctor.

The data extract presented below illustrates the way in which respondents configured modafinil as a medicine. According to script theory (Akrich, 1992) technological objects come with scripts or instructions for use which not only provide a framework of action but also define actors and the space in which they are supposed to act. Moreover, in their interaction with the technology the prospective user is encouraged to find an adequate puzzle for the solution which the machine offers (Woolgar, 1991). The script that comes with this reading of the technology includes a serious problem that needs help, with actors given the roles of medicine, doctors and patients.

"Yes it should be available - on prescription only I think. If they have got a serious case of it and it was affecting their work, then with the doctor's assistance- they should be able to prescribe it to them" (Alan, Retail staff)

Although a disease-centred framework of understanding was readily applied and medical expertise valued in respondents accounts, the application of a pharmaceutical solution to sleep problems was not uncritically accepted. The majority of respondents positioned modafinil as a medical treatment that they would consider taking under medical advice as a 'last resort' if there was something 'really wrong' with them that would 'merit taking a tablet'. They also provided several caveats: that they had spoken to their senior managers about their problem; taking the drug did not negatively affect their performance or judgment; there were no health risks; and that they were unable to change their shift pattern. All but two of the respondents said they would not *want* to take a drug to keep them awake at work, even as a treatment for a medical disorder, and expressed concern about potential health risks it could pose.

It was frequently suggested that other ways of promoting sleep and alert wakefulness *should* be tried before 'resorting to drugs' and there were other things individuals could do to try and 'get a decent sleep' that would be more 'natural'. Here, respondents often referred back to their routines, practices and technologies that they currently use to promote sleep/ alertness. For example, having a bath to calm down, relaxing the

brain and body before going to bed, going to bed at the 'right' time, making sure the room is darkened and peaceful, or taking herbal remedies.

According to Rose (2007) psychopharmaceuticals[36] are promoted not as an external control, but as a way to restore the authentic self. He argues that such drugs are bound up in certain conceptions of how humans should be and that specific norms, values and judgements are internalised into these drugs. At present, when thinking about modafinil it is harder to make the same argument as respondents placed more value on getting 'a decent sleep' than on enhancing their wakeful state. This may be explained by thinking back to how sleep and wakefulness were understood in shift workers accounts. Sleep was constructed as a period of time for rest when the body would repair itself and become re-energised. Feeling tired or sleepy at work was seen as a consequence of 'broken' or inadequate sleep. Workplace sleepiness was not understood as broken wakefulness. In this view, wakefulness is not broken so does not need to be fixed, conversely if sleep can be fixed, the body will be re-energised so alert the following day and there would be no need to take the drug. Only one respondent thought the idea of taking a drug to promote wakefulness was more appealing than taking a sedative (Karolina, Nurse).

However, the act of taking the pill was still understood as restoring an 'authentic self' as Rose (2007) suggests. Within this framework of understanding, falling asleep/ struggling to stay awake at work was considered to be problematic. Through consultation with a doctor such problems can be assessed, verified as 'real' or 'serious' and warranting of medical attention. The act of taking modafinil is then considered to be therapeutic, acting to relieve suffering and help the shift worker feel well again.

"...if someone was struggling to stay awake or they were having problems, then I think that [modafinil] should be publicised...because it is prescribed by a doctor

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[36] Rose is talking about Paxil and Prozac which are used to modulate affect as opposed to cognition.

they have got the last say in it, so they can see if people need it or not" (Edie, Call centre operative)

Some questioned whether people who cannot tolerate shift work should be given drugs or should change their jobs. However, it was acknowledged that some people such as those in medical professions and the emergency services do not have a choice in the shifts they work and that these individuals 'have a right to treatment' so should have the option or choice to take the drug as a medical treatment under medical supervision. But, this should be just one of many options available to them and they should be fully informed about the both the benefits and risks of drug treatment.

"…the services that people use require people to work shifts. So although yes, they have chosen to do that occupation - medical, ambulance - I think there is a need to look after these people and if they do need these drugs - yes, it should be available for them, because just as anyone else, they have got a right for treatment'. (Matt, Police officer)

Although not opposed to 'medication', one respondent thought that there should be much more emphasis placed on other ways to 'help yourself' before 'resorting' to taking a tablet. She hoped people would look for alternatives before using 'medication' but accepted that if someone was 'struggling' at work and sleep deprivation was really affecting their health and impacting on their work modafinil 'would certainly benefit them' (Karolina, Nurse). Additionally, the employer was thought to have some responsibility or duty of care toward their employees. While all agreed it would be unethical for an employer to expect their employees to take any sort of pharmacological agent to enhance their performance, they thought employers should look for strategies to lessen the problems faced, and provide information about medical treatments as one part of that.

The technological script was in this case therefore, read as a way of restoring a normal or 'authentic' (Singh, 2005) level of functioning, whereby through their interaction with the technology the user would become themselves again. Despite this, as found in the scientific discourse, solutions to the problem of sleep deprived workers were not solely conceptualised as medical interventions at the individual level, which it has been argued in the medicalisation literature, has become institutionalised as the only proper way of dealing with illness (Strong, 2006). Instead, disease and disorder were understood as resulting from a combination of biological (those unique to the individual e.g. own body clock and common to everyone e.g. design of the body) and social factors (both working conditions and other aspects of lifestyle e.g. diet and nutrition) and the solutions posed also followed this model.

In the main, the way shift workers perceived the role of medical experts appeared to conform to a traditional doctor-patient relationship, whereby the patient would present to the medical expert if they considered something to be wrong with them and expect medical treatment or advice to return them to health (with conceptions of normality understood through medical discourse). However, there was some evidence of the conception of medical experts as 'consultants' that are gatekeepers to both information and medication (Chatterjee, 2005). In this view, although the decision of whether to prescribe medication ultimately resides with the doctor, it is still the patient's choice whether they seek medical advice in the first instance, and if prescribed treatment, whether they decide to take it (Strong, 2006). The patient (or consumer) would use the medical expert as resource to access specialised information or medication as desired; or if they thought they could not get this elsewhere. For instance, one of the respondents thought that although he might consider seeking medical advice about sleep problems if he was 'desperate' (David), he would not know whom to seek advice about workplace sleepiness from and doubted whether his GP would be able to tell him anything he did not already know. Another respondent said she would not go to her GP because she would not want to resort to prescription sleeping tablets, expecting this would be the only medical advice

available. In these instances the individuals chose not to consult a medical professional about their sleep problems instead opting to manage by themselves using their own lay-expertise and experiential knowledge of what works best for them.

Modafinil as an OTC pharmaceutical product

In a second configuration as an OTC pharmaceutical product, modafinil was still understood as a treatment or therapy for impairment or suffering resulting from shift work, however, one that shift workers should have access to outside of medical authority or without having to go through a clinical encounter. Although this interpretation of the technology was present in the data, only two respondents said they would consider taking a wake-promoting drug in the workplace outside of medical authority. As demonstrated below, respondents raised fears about drug use, relating to the possibility of reliance or dependency, leading to respondents reasoning that they would not take the drug on a regular basis.

> "I wouldn't take it on a regular basis, just so I didn't get too hooked on it or become too reliant on it, but I would take it, like, if I know that I'm going to be on night shifts next week then I would take it to get myself prepared for it and probably go out and buy it beforehand" (Kim, Nurse)

Although some respondents thought that modafinil should be more widely available to shift workers, they expressed concern about the amount of drugs that are available 'off-the-shelf' (Karolina) and on the Internet and built in a level of control into their accounts. They feared that in some cases the problems people experience might be due to a 'hidden medical illness' (Kim) or stress, and worried that self-medication might not be the right answer. However, they thought that having to go through one's GP to access the drug seemed 'harsh' and that a better route might be through the pharmacist, who could ask questions before giving out the medication rather than anyone being able to pick the tablets up off the shop floor.

The extent to which pharmacists are seen as separate from the medical institution was not investigated in this study. Many GP surgeries work in partnerships with local pharmacies (e.g. through the Pharmacy First scheme), with pharmacists providing check-ups and supplying appropriate medication for common afflictions and infections. Patients also have contact with pharmacists who dispense their prescription medication and often offer advice about its consumption. Speculatively, pharmacists already operate at the periphery of the medical institution and as such are seen as possessing relevant professional knowledge to act as gatekeepers for this medication.

> "It should be sold, you know how in the chemist, they've got that little bit where you can go in and ask your questions before giving you a medication. I don't think it should be just offhand where people can just walk in and pick it off the shopfloor, [there] need to be asked some questions first" (Kim, Nurse)

For most respondents the potential affect the drug could have on alertness was most appealing as opposed to its other cognitive enhancing properties. However, most of these respondents believed in 'natural' intervention first with some explicating that they were not advocates of drug-taking for the sake of it, but reasoned that when one has work, financial and family commitments taking a drug like this could really help people cope. It was argued that if someone was having problems and taking the drug helped them and made them function better this would be acceptable. As demonstrated in the data extract below, this type of use was clearly differentiated from 'enhancement' uses of the drug as its use was not understood as increasing, improving or boosting cognitive performance. Again, the act of taking the drug was seen as a way to regain an authentic self, a way to repair a performance deficit and regain a normal level of functioning for that individual.

> "On a night shift when you're really tired, you're not quite as alert and attentive as you would be, it just helps you to be as you normally would be then that's

different to saying that you're going to give them some wonder drug that's going to actually increase their cognitive abilities." (Hamish, Medical doctor)

Norms change in response to biomedical advances, new therapies and as living conditions change (Presidents Council on Bioethics, 2002). Wolpe argues that 'clearly, some of the top selling drugs in the world today are being used by patients who fit no traditional definition of pathology, yet still see in their own functioning a deficit that these drugs address' (2002: 382). In the most part, this appears to fit with shift workers understandings of modafinil use in the workplace.

Modafinil as a safety tool

In contrast to the configurations of modafinil use and users discussed above, in a third configuration modafinil was interpreted as neither therapy nor individual enhancement tool, but as a type of safety apparatus. Use of modafinil was constructed as a way to prevent accidents and mistakes in the workplace, reducing the risk of harm to self and others. Legitimate users were (re) configured as responsible and altruistic adults taking the drug for the benefit of others, in some cases even if it was putting their own health or safety at risk. Examples of this type of user given by respondents were generally individuals whom through their job were in a position of care for the welfare and safety of others. These included doctors, nurses, pilots, police officers and other emergency services personnel. Within this frame, safety was the most important consideration in the legitimation of drug use.

> "I would look at the whole safety aspect...if it showed that people were functioning better and there was less errors and patients were getting a lot better care, then it wouldn't bother me at all... I would just want to know that they are safe to work that day and that they are fit for practice that day and that should be all that mattered in our profession." (Karolina, Nurse)

Sahakian and Morein-Zamir (2007: 1158) compare cognitive enhancing drugs to caffeine and assume that 'cognitive enhancers with small or no side effects but with moderate enhancing effects that alleviate forgetfulness or enable one to focus better on the task at hand during a tiring day at work would be unlikely to meet much objection'. They go on to ask 'does it matter if it is delivered in a pill or a drink?'

Occasionally, some respondents thought that taking a drug was an acceptable route to 'keeping awake' at work because people already use caffeine and energy drinks for that purpose. Drug use was understood in terms of its effects on the shift worker and positioned in line with existing technologies. In some accounts comparisons were drawn with high sugar and caffeinated energy drinks, with respondents arguing that these are currently used for the 'same reasons' as the drug would be so likewise it should be acceptable. The end goal of being a safe practitioner was viewed as being more important than how one achieved their state of alert wakefulness.

However, in the majority of accounts, drugs were clearly demarcated from foodstuffs and herbal remedies. In general, these respondents did not oppose other ways of intervening in the sleep wake cycle, such as drinking coffee, energy drinks or using alternative medicines which were described as more 'gentle' or 'natural' than 'tablets'. In the data presented below, a police officer is describing how on a personal level he does not like taking tablets to keep him going, although he thinks he sounds hypocritical because he uses energy drinks to promote wakefulness but would not use drugs for the same purpose. He justifies his attitude towards drugs through fears of dependency and addiction. Addiction in this case is thought of as having a physical basis in the body.

"I would rather deal with it through diet or with exercise…I don't want to end up being dependent on anything and I hate the idea of my body being addicted to anything…I just don't like taking tablets or anything like that to keep me going. I

know that's a slightly hypocritical - like taking an energy drink - however I do

that as sparingly as I can" (Matt, Police officer).

It is interesting that in both academic and media discourses it is often the image of a drowsy doctor about to perform life-saving surgery that we are presented with to argue that there is a real need for technological augmentation of wakefulness in some professions. In these instances, the act of taking psychopharmaceuticals is framed as potentially life-saving (e.g. Sahakian & Morein-Zamir, 2007). An argument is often made in the philosophical literature and echoes can be found in popular discourses which prioritises the 'safety of others'. For example, a doctor working in a hospital in an emergency ward needs to be alert and cognitively able for extended periods of time so she can do her job properly. Accuracy, concentration and alertness are essential. The lives of patients are at stake if the doctors cognitive functioning declines. Cognition enhancing drugs are then positioned as a way to prevent decline in functioning so lives of others will not be endangered when the doctors has to work under pressure for extended periods. The conclusion nearly always drawn is that drugs should be allowed in these circumstances.

However, the accounts of the two doctors interviewed reveal techniques and practices embedded in their everyday lives, both inside and outside the workplace that in some respects centre around the very issue of patient safety. When the enhancement technology is placed in context, the relevance of utilitarian philosophical arguments; that enhancement is for the 'greater good', are not as convincing. The data presented here raises questions as to if there is actually a safety problem posed in the first place which casts doubts as to whether the technology is in fact needed. In practice doctors are able to take breaks, sleep, have other technological aids such as alarms and computers and are surrounded by support staff. The heroic image of the lone surgeon struggling against sleep fighting to save innocent lives seems detached from clinical reality. Without a 'danger' of impaired doctors and a heightened 'risk' to patient safety,

the technology cannot so easy be enrolled in the socio-technical network operating in this workspace.

Modafinil as a cognition enhancing drug

Positive assumptions regarding the demand, social need, impact and desirability of cognitive enhancement technologies are in abundance (Chapter 1) and directly influence the ethical issues that are prioritised in neuroethical discourse (Martin & Williams, 2009). Specifically, talking about its use in the workplace, modafinil is assumed to extend workplace productivity through improved cognitive functioning; and reduce risk of mistakes and accidents through promotion of alertness, thus being of benefit to employers, individuals and wider society alike. Commentators regularly write about the 'growing demand for cognitive enhancement' (Greely et al, 2008) with some predicting that 'the drive for self-enhancement of cognition is likely to be as strong if not stronger than in the realms of 'enhancement' of beauty and sexual function' (Sahakian & Morein-Zamir, 2007: 1159).

As discussed earlier, for most of the shift workers interviewed an acceptable level of performance was considered to be achievable through existing formal and informal mechanisms, techniques and technologies meaning that workplace sleepiness was not considered problematic. Without a performance deficit, the question then becomes about enhancement rather than therapy and how modafinil might fit into existing practices, socio-technical networks and spaces as a tool for self-improvement. In this section shift worker views about cognitive enhancement in the workplace are presented to in order to question the assumptions made about demand and desirability to enhance and to explore the social and ethical issues this stakeholder group perceive to be of most relevance to them.

Although many respondents did not see a personal need for the drug, in general they did not have any problems with the idea of their colleagues using such substances, as

long as it was a personal choice they had made. However, efficacy emerged as an important consideration. Respondents reasoned that some people perform better than others in the workplace anyway so for some workers this drug could be 'good' for them. However, the extent to which the drug improved performance did affect its perceived desirability, with one respondent reasoning that although he thinks he is good at his job so does not need a drug to improve his performance, if most people at work were taking a drug and their performance was markedly improved he would consider trying it too (Mo, postal worker). In the account below the respondent discusses the issue of efficacy. He draws on the notion that everyone reacts differently to different drugs and reasons that even though taking a drug to enhance cognition might make some individuals more productive at their job, it could have an adverse reaction in other people and make them ill. He thinks that for this reason large companies would not promote drug use amongst their employees, as they have a duty of care and would not want to be seen as promoting something that could cause harm.

"…if that affects the person [positively] then more people might want to take it, but I wouldn't see the company promoting them because the company has a duty of care for the employee…even though the side effects maybe increased productivity, they would also have other side effects - they have always got the other side of it and different people react differently to everything" (Alan, Retail staff)

When talking about using modafinil as a cognitive enhancer respondents' accounts were generally apprehensive and sceptical that the drug would work and there would not be a 'price to pay' (Hannah, support worker) elsewhere. With reference to other drugs and drawing on experiential knowledge they questioned the safety of the drug and raised concerns about what other effects it could be having on the body. Their reluctance towards taking pharmaceuticals was based upon lack of knowledge about what the drug could do to their body; concern about potential side effects; becoming dependent or addicted to something, arguing that there are more 'natural' ways to do

things. As illustrated below, they saw the drug as 'stopping' sleep and 'forcing' wakefulness and reasoned that this would probably have negative effects on the body.

"We're not designed to stay awake all that many hours, we need to regenerate, so I think to be forced to stay awake…studies had shown that you do actually need a good eight to nine hours' sleep before it starts having an effect on your memory and your brain, so I wouldn't take it" (Hannah, Support worker)

The use of modafinil to enhance cognitive abilities was differentiated from taking it in the workplace. In the context of shift work the drug was generally perceived as a therapeutic technology: a way to restore a normal level of cognitive functioning. This was viewed as a legitimate use for the drug whereas a technology that could be used to boost performance beyond a normal level was thought of in terms of a 'miracle' (Mo, postal worker) or a 'wonder drug' and was treated with scepticism. In the account below the difficulty of arguing against an 'enhancement'- something that would make you perform better is acknowledged.

"Well, yeah, that's a tricky one, because, kind of, can't say no, really, can you? But it just doesn't sound right! I think that would be a bit worrying, to be honest" (Hamish, Medical doctor)

Medicalisation theory can be used to understand how drug use is legitimated in some scenarios through the idea of 'normalisation' (Conrad, 2006), but uses that fall outside of this, for the purposes of performance enhancement have more dubious connotations. Through an understanding of modafinil as a treatment or safety tool, the use of psychopharmaceuticals by healthy individuals was seen as a form of drug abuse. In the absence of any deficit or threat to safety, the substance is not being used to relieve suffering, to restore normal functioning or to improve safety. Instead its use was thought of as an attempt to make the individual better than well, gain an

advantage over others or improve oneself above the norm, which was conceptualised as an abuse of its intended effects.

"If you're going to have a night out, I don't think you should take it, no, I think that's a bit ridiculous…it's for people who work, you're not going to work when you're going out drinking, are you?! You're just going out to have a laugh and stuff. So, no, I don't think you should take one if you're going out drinking, no, no way!" (Mo, Postal worker)

The social use of modafinil, outside of the workplace by those without problems or impairments and who were not in a position of responsibility for others was seen as illegitimate. Illegitimate users were then, configured as those who choose to stay awake longer for their own benefit, thus illustrating how both the context in and purpose for which the drug is used is of importance in the perceived acceptability of its use.

In shift workers' accounts, comparisons were drawn between modafinil and existing pharmaceutical technologies such as sedatives, caffeine pills, paracetamol, diet pills and laxatives. Discursively such comparisons enabled fears to be raised about the pharmaceuticalisation of sleepiness/alertness (Williams et al, 2009) through the potential for widespread use and the risks to health this could pose. These fears were justified through the fact that modafinil is still a relatively new drug and has lots of unknowns attached to it. For example, one respondent described a new sleeping pill he had read about which gave users 'bad nightmares' and could lead to dependency (Matt, Police officer). Through this comparison he raises his own concerns about the negative impact modafinil could have on health and the body. He uses this story to argue that if the drug has addictive qualities or can be abused it needs to be prescribed so these impacts can be controlled. In fact, most respondents argued that controlling access to modafinil through medical prescription would be the best mechanism to prevent widespread use and stop potential damage or harms to health

this drug could cause. Others questioned the appeal of extending wakefulness and were unsure as to whether it would be something they would want to experience (Mo, Postal worker).

These findings indicate that perhaps, the demand for cognitive enhancement is not as obvious as is assumed in neuroethical and media discourses. Although some potential benefits to the drug were recognised, discourse was dominated by fears and concerns raised over safety of the drug and potential harms to health it could lead to. Others explicitly questioned the appeal of cognitive enhancement. This has been identified (Williams & Martin, 2009) by some commentators who recognise that there is little empirical evidence that large numbers of people are interested in using cognitive enhancers and strong anecdotal evidence for each side of the debate. Williams and Martin argue that 'if enough positive assumptions are made about these key issues [safety, efficacy and demand], then almost any technology can look attractive or inevitable' (2009: 532).

Although taking modafinil could be seen as fitting in with an array of practices outlined in the previous section to control sleep, somnolence and promote alert wakefulness, cultural attitudes towards drugs and associated fears of harms to health, abuse, addiction and dependency may in fact form a barrier preventing widespread acceptability and use of pharmaceutical enhancement technologies.

Some argue that the very existence of technology poses constraints on choice of how one lives one's life (Cahill, 2004). In the case of modafinil, the existence of a technology which allows the possibility of achieving a prolonged wakeful and mentally enhanced state both provides and constrains choice. For example, modafinil could come to be seen as a way to escape the constraints of the biological body allowing one to choose when to sleep and when to work, or equally as likely, the only way to effectively manage sleep and work in a 24 hour society. It was the latter view rather

than the former that dominated shift workers accounts. Such visions of the future expressed by shift workers are outlined in the next section.

<u>Visions of the future and their performativity</u>

Most respondents thought that if drugs like modafinil were to be widely available in the future they would have a huge impact on the workplace and the workforce. Around half of those interviewed thought that modafinil should be made more widely available to shift workers in the future without prescription, provided that it was a 'completely friendly drug' (Hamish, Medical doctor) that was 'well researched' (David, Medical doctor) and 'shown to benefit shift workers' (Hamish, Medical doctor). Despite this, respondents still worried about potential effects on the body of prolonged use, the potential to become dependent on the drug and questioned whether taking this drug frequently would be a 'good idea' (Paul, Factory worker).

Visions of the future workplace were commonly constructed in respondents' accounts. In the main, these were characterised by fear, concern, and worry. Modafinil was thought of as a 'wonder drug' to deal with lack of sleep that would be used to create a new type of worker who was more intelligent, alert, safer and productive. It was thought that employers would push toward this and go down 'a dangerous road'; a 'quick fix route' that 'opens the door' to an environment of 'massive competition'. Respondents feared that other drugs will be 'spawned' to not make people healthier, but to make them function better, in part fuelled by the money to be made by drug companies. This 'playing with biology' was thought of by some as 'dehumanising'; 'turning people into robots' so they could 'run around like mad men' just to do more overtime, resulting in an 'artificial workforce'.

> "It will make an artificial workforce…people will end up becoming dependent on these things because it will mean that that's the only way they can be better - or there will just be then a further escalation in developing better drugs which

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aren't really in the end for making people healthier, it will be just about making a new, more intelligent, more alert workforce, which I think just dehumanises…you are opening the door where it is just massive competition and I think that's quite dangerous…(Matt, Police officer)

Hyman (2006) identifies one of the imagined risks of cognitive enhancement as inequality; and accounts a vision of the workplace in which medication is required either implicitly or explicitly for success. The expectation that improved cognition will lead to better, more productive, efficient and successful workers in deeply entrenched in the academic literature. In shift workers accounts, fears of coercion sprung from ideas of unrestricted access to and legality of the drug. It was feared that in the future even if one does not want to take these drugs they might end up taking them because taking drugs will become the only way to 'keep going'; 'be better'; 'get ahead' and 'do better'. Allied to this were fears of widespread use leading to dependency, especially by those in challenging and pressured jobs. Bearing some similarity to the neuroethics and media discourses, shift workers imagine the future workplace as a place filled with people that are self-medicating and using taking tablets to do their job, rather than people with legitimate knowledge or adequate skills.

"It would be a bit weird, I think it will open up a door to lots of other things- you could have tablets for this, tablets for that so instead of having people who actually know what they're doing, you might just have people who are taking tablets…" (Hamish, Medical doctor)

Others questioned whether it would be fair to allow unrestricted access to a drug which could potentially improve performance in the workplace. Respondents imagined a future workplace where everyone was taking the drug all the time to perform better and it argued that this would somehow devalue their performance (see data extract below). Comparisons were drawn with steroid use by athletes to argue that drug consumption would give users an unfair advantage over other colleagues who had not

taken the drug. One respondent drew on her own experience of taking caffeine pills to promote alertness to argue that modafinil would be 'better off' being prescription only to prevent it being abused in this way.

"It almost makes you think 'well is it fair?' I could imagine turning up to work and having a few of the lads just taking those constantly and they are getting better results at their job and it almost seems a bit fake - like an athlete taking steroids. It is on the same level as that. If everyone was taking it then I think it would be a problem, but if only the people who really needed it were, that I would be a lot more inclined to be happy for them." (Edie, Call centre operative)

These dystopian visions of the future framed respondents' attitudes in the present. The perspectives of all respondents converged on the issues of medical expertise and control of the technology. The medical profession were seen as ideally suited to control use of the drug, to ensure benefits are there for those who need them whilst protecting against potential harms to both the individual and society. Drawing on past experiences and situations respondents imagined future uses and users of the technology and evaluated the potential implications of these in terms of the present situation. They used this strategy to justify action in the present, namely, fears over increased competition, illnesses, side effects, addiction, dependency, and reliance on substances were used to argue for continued medical supervision of the drug to ensure treatment for those in need whilst protecting against detrimental effects .

"...on the basis of what it can give you maybe it should be a prescribed thing…I would say that it probably would be something that needs to be controlled…a doctor- someone with some kind of medical knowledge that will have the interest of the person's health more than the performance of the person" (Matt, Police officer)

In summary, it was argued that presently, modafinil should be available to shift workers on prescription not as a first line intervention as suggested by Rose (2007) but as a 'last resort' if the individual was 'seriously' affected by shift work and 'really needed' the drug. Medical professionals were thought to be in a position to assess whether someone was in need of the drug and medical supervision of the drug was viewed as a way to control access so prevent abuse. Illegitimate users were configured as those who are already functioning normally so do not need treatment.

Summary and conclusions

This chapter takes an empirical approach to explore the complex social context of shift work from the perspective of shift workers and argues that the way we live our modern lives acts to both create and constrain particular understandings of sleep, wakefulness and the body. A contextualised understanding of these phenomena shapes which particular social and ethical issues surrounding pharmaceutical augmentation of sleep and cognition are deemed relevant by this community to themselves as individuals in the conduct of their everyday lives.

Overall, sleep was constructed as an essential part of everyday life, a personal and private period of time for the body and brain to rest and repair. Workplace somnolence was something which all of those interviewed had experienced at one time or another. However, the way in which this behaviour was constructed differed between respondents and was related to their occupational role. The information gained from the accounts of those interviewed sheds some light on how sleeping behaviours are embedded in specific institutional norms and occupational cultures. Where safety of others is paramount, from the hospital or clinic to the factory floor, the dangers of sleepy bodies are recognised and controlled for through both formal and informal practices, at the institutional and individual level.

Although periods of sleep and wakefulness were understood as embodied experiences partly under biological control, the acts of 'going to sleep' and 'waking up' described were acutely social. Notions of self-governance of and individual responsibility for varying states of somnolence were strong in shift workers discourse. These behaviours were embedded in existing practices and privatised routines (Hislop & Arber, 2004); informed by cultural norms (Seale et al, 2007), experiential knowledge (Meadows, 2005) and scientific understandings of the body (Rose, 2007); and importantly, thoroughly mediated through numerous technologies. Modafinil then, fits into these existing practices in various ways depending upon cultural conceptions of normality, values of individuality and the pursuit of health, wealth and happiness in the modern workplace.

Neither the configuration of the technology or user was settled or established in shift workers accounts, with both subject to flexible interpretations. Legitimate users of the drug were configured in two ways. Firstly, as patients who had been diagnosed as ill or in need of medical treatment and prescribed the drug by their doctor through a clinical encounter. Secondly, those suffering impairments due to their working conditions whom, through a process of self-monitoring, might choose to take the drug to mediate their own sleepiness/alertness both in and outside of the workplace. Those experiencing some sort of deficit saw pharmaceutical treatment as one part of the solution for them, regardless of whether the drug was accessed independently or administered through a medical consultation. In both instances use of the drug was conceptualised as acting to restore impaired functioning and return the individual to an authentic or normal level of health. This was partly achieved through medical discourse, labelling and defining changes in sleep practices as symptoms of a disorder, which in turn, removed some causal responsibility from the individual. The medicalisation of sleep was accompanied by powerful images of illness, healing and (ab)normality which acted to make drug use appear socially acceptable.

The use of modafinil in one's daily life without medical control was raised as a possible configuration of technology and user. In its configuration an OTC modafinil was often accepted, in which individuals could choose to self-medicate if they so wished. Although some potential benefits to the drug were recognised, discourse was dominated by fears and concerns raised over safety of the drug and potential harms to health it could lead to. This type of use was still understood as therapeutic, perhaps reflecting the changing nature of patient into consumer, who has their own knowledge, expertise and can choose how to treat themselves in consultation with a variety of expert knowledges and institutions (Rose, 2007). However, when the technological script was read in this way, modafinil did not easily fit into existing practices, techniques and technologies used to manage sleepy bodies. Instead it was positioned as a last resort, something which one could take outside of their usual routines if they perceived something to be wrong with them or had this confirmed by a medical expert.

Alternatively, modafinil use was understood as a safety tool, a way to boost cognitive performance, alertness and reduce tiredness. Often, no illness was deemed necessary for drug consumption and in some instances OTC availability of such a substance thought appropriate. This formation of technology and user was quite different from the 'medicine as enhancement' configuration discussed by Clarke et al (2003), as use of the drug was justified on the grounds of public safety rather than individual health, prevention of illness or improvement of bodies.

According to Woolgar (1991) the interaction between technology and user invites assessment both whether or not the machine is acting like a real machine and whether or not the user is acting like a real user. Users take their place within a cast of roles, designated by both the producers of technologies and culturally available technological scripts that proscribe how a technology should be used. De-scription (Akrich, 1992) on the other hand describes the process by which end-users can re-write these scripts- as evidenced in the case of self-medication and management and acute use. However, the extent to which these scripts exist independently from the

producers and promoters of the technology is questionable and has not been subject to empirical investigation.

When the technological script of modafinil was read as a medicine, the corresponding cultural script was one of healing or relief from suffering. In the absence of this, use of drug outside of this script was equated to abuse, using the technology in an unintended and illegitimate way. The technology was differentiated from foodstuffs and other technologies on the grounds that it is a medicine. It is delivered in pill form which set it apart from most foodstuffs (with the notable exception of caffeine pills) and mechanical technologies (e.g. alarm clock, black out blinds, brain training games) used to control sleep and boost cognition. Instead, it was likened to other medicines, pills, drugs and tablets that are available in various forms in British society and was positioned in line with these cultural scripts. How the substance is regulated, controlled and presented to the potential user (as either medicine or consumer product) and what this implies in relation to health benefits and the safety of consumption come to the fore as important considerations in whether the chemical augmentation of cognition was considered to be legitimate or not.

Work-related use of the drug was demarcated from general recreational use. Overall, shift workers accounts were sceptical of proposed benefits of psychopharmaceutical enhancement to themselves (in terms of becoming better) and fearful of harms to their bodies. There was little evidence of desire to use enhancement technology in the 'remodelling of the self', despite the exploration of existing rituals and routines that demonstrated how the acts of going to sleep, waking up and staying awake are already thoroughly mediated through various technologies in everyday life.

Around half of respondents thought that modafinil should be more widely available to shift workers. The broader social and cultural context of cognitive enhancement was given importance through the construction of futures where access to drugs such as modafinil would be unrestricted and widespread. Through the figure of the future user

(Wilkie & Michael, 2009) visions of future were often constructed in respondents' accounts which enabled fears surrounding coercion, safety and efficacy of drug use, addiction and dependency to be raised. Socially, concerns over implicit coercion and shifting standards of normal workplace performance were discussed. It was feared that unrestricted availability of the drug could transform the workplace into a more competitive environment in which taking a drug would become the only way to keep up and perform optimally. Both the appeal of extending wakefulness and the need for cognitive enhancement were questioned by this group of individuals. Medical control of the substance via prescription was agreed upon to be the best mechanism to ensure benefits to those that need them, whilst protecting other individuals and society of potential harms the drug could lead to. Medical professionals were thought of as possessing medical knowledge and to be interested the patients' health rather than their performance. Therefore they were thought to be in a position to assess whether someone was in need of the drug and medical supervision of the drug was viewed as a way to control access so prevent abuse.

Situating cognitive enhancement in the context of the workplace allowed some key assumptions found in neuroethical debates to be questioned. Firstly, that there is a widespread desire to use cognition enhancing drugs to enhance performance (as drug use was typically thought of in terms of treatment or protection, not enhancement). The expectation that improved cognition will lead to better, more productive, efficient and successful workers is deeply entrenched in the academic literature. It was evident that in the neuroethics literature cognitive enhancement is too easily equated with beneficence at the individual level. Through the notion of modafinil as a safety tool in particular, this was questioned with drug use seen as a move towards safety and providing better care for others whilst potentially putting the individual's own health at risk from any possible side effects of the substance. In addition, the analysis has highlighted the extent to which therapy and enhancement are qualitatively different as respondents did not perceive a need for enhancement in the same way those with problems have a need for treatment. Whilst medicalisation acted to legitimise use of

the drug under specific circumstances, there was evidence of resistance towards pharmaceuticalisation of cognition for those without problems or impairments.

From these findings it is evident that there is still a strong cultural tendency to associate drug taking with illness, addiction, dependency and risks to health which may provide a barrier to widespread psychopharmaceutical use outside of medical control. At present, demand for and desirability of cognitive enhancement may be far less abundant than imagined in ethical debates.

Chapter 7: Exploring imagined uses of modafinil by students

Introduction

The use of chemical substances to alter mental states, whether for the purpose of healing, enhancement or simply for pleasure, is not a new phenomenon. However, over the past few years there has been an upsurge in interest both within and outside of bioethics regarding the promises and perils of new neurotechnologies, particularly psychopharmaceuticals that have the potential to be used as cognitive enhancers. Some of those involved in ethical debates recognise, and have raised awareness of, how the broader social context of use may shape different paths along which cognitive enhancement might develop. Recently, there have been calls for a more realistic perspective of the drugs currently available through the empirical investigation of concrete cases (Schermer & Bolt, 2009; Forlini & Racine, 2009).

As outlined in Chapter 1, university students are often depicted as both existing and imagined future non-medical users of cognition enhancing drugs. As discussed in Chapter 2, the relationship between medical and enhancement uses of this technology is complex and tensions exist in demarcating legitimate use of medical resources from unjustified social control and in the separation of positive and negative applications of the same substances outside of medical authority.

The aim of this chapter is to analyse the ways in which prospective users of modafinil understand, position and negotiate use of modafinil in the context of their everyday lives. It focuses on uses of the drug in one specific social context, the university, by one prospective user group, students. Specific research questions addressed include: How are sleep and cognition conceptualised by students? How is modafinil use understood, positioned and negotiated in this social domain? What sociotechnical scripts are associated with modafinil use and how is it positioned as a medical or non-medical technology? According to what norms do students believe that augmentation

of the mind should take place? What role is given to medical authority in deciding if particular uses are acceptable?

The data presented in this chapter were drawn from semi-structured interviews with fourteen undergraduate students from the University of Nottingham. Firstly, a description of student life in 2008/9 from the perspective of these students is provided, discussing how these students understood sleep and use existing technologies to mediate states of sleepiness/ alertness, after which, the discussion moves on to analyse the ways in which modafinil was understood and the different ways its use was positioned by this group of prospective users in the contexts of their everyday lives.

Sleep, cognition and flexible living

The students that were interviewed all described busy and hectic schedules incorporating heavy study workloads, active social lives and most were also in paid employment. The flexible and varied nature of university work appealed to most of the respondents, giving them independence and allowing them to work when it suited them. In their collective accounts the day and night worlds seemed to merge somewhat with respondents reporting both study time and social activities that spanned the full 24 hours of the day seven days a week. Some identified themselves as being a 'morning worker' (S6: Louise) or 'more of a night person' (S13: Nick) (larks and owls in the scientific discourse) although this was usually attributed to desirable social and environmental conditions rather than biological factors. For instance, students felt they could work better at these times dues to less noise and distraction with more resources being available (e.g. access to computers and books in the library). For some students such working patterns were a regular occurrence, however, the majority of respondents said that they only followed this pattern of working when under pressure or when it was 'an emergency' (S8: Bella), for example before a deadline or over examination periods.

Many of the students recognised the importance of time out from study and work, linking their emotional well-being to social networks and social activities. Most of the respondents had formed social networks at the university, either through their course, recreational activities or living in shared accommodation. Sole focus on study was linked to stress, isolation and loneliness whereas, being around people of a similar age and situation was said to be both an important and enjoyable part of university life. This is illustrated in the extract below where a second year student is talking about his work/ social life balance. He says:

> "In the second semester I just completely focused…I said I was happy but I was actually getting a bit lonely and more stressed because I wasn't having time out…I just didn't see anyone. I'd come in, work and I could go a whole weekend and not see anyone." (S9: James)

As demonstrated in the data extract below, although many of the students interviewed were uncertain as to exactly what sleep was for, sleep was commonly constructed in functional terms as a vital and natural period of time for the body and brain to rest and relax, repair, rejuvenate and recharge. When describing the effects of lack of sleep, students stressed the importance they placed on getting enough sleep through drawing on their own experiential knowledge, which included both their own experiences and the experiences of people they know. They discussed how lack of sleep could lead to illness, an impaired immune system, low mood, irritability and result in a poor diet, lack of concentration and focus, impaired daytime functioning and cognitive performance, ability to learn, and have a negative effect on their appearance.

> Interviewer: What do you think sleep does?
>
> S12: Chris: I've no idea! I'm presuming while I'm asleep my body's got a chance to recharge itself and find a second energy or something, mend whatever's not working properly. I'm not sure.

To a lesser extent and somewhat overlapping with the first, a second conceptualisation of sleep emerged in the data where sleep was understood as a waste of time. Respondents said they got up at a particular time in the morning so that they were not 'wasting time in bed' (S4: Emma). Reducing the sleep period was linked to more time to do other things with most respondents saying they would go to bed when they got tired or when there was nothing else for them to do. All of the students interviewed said they would prioritise social engagements over sleep and most put university and paid work before sleep too.

"I do love my sleep, it is important to me, because I do feel I need it, but at the same time I cut back on it for other things" (S9: James)

When and for how long one should sleep was open to debate in this domain. Only one respondent linked sleep timing to a 'biological mechanism', although a few did mention their 'body clock' (S5: Joseph) they did not see this as determining their sleep timing or duration. In stark contrast to the shift workers accounts, as illustrated in the data extract below, most of the students interviewed thought that they were in control of sleep.

"I can just stay up till whenever, so I can do work and then switch off when I feel like it." (S7: Daniel)

Respondents reported that they thought they needed between five and ten hours of sleep per night depending on how active they were in the day and what they had to do the next day. Despite this, most said they usually got between four and seven hours sleep a night, 'catching up' by sleeping longer on the weekends or taking naps in the afternoon when they did not have any lectures or work commitments. When asked why they thought X number of hours was enough sleep for them, the answers varied. Many of the answers provided had a strong normative dimension describing 'the right amount' of sleep that one is 'supposed to get' (S7: Daniel; S12: Chris), where sleeping

too little, too much, or past a certain time in the morning was referred to as being 'bad' or 'lazy' (S7: Daniel). In the following extract, one student describes how he actively tries, and often fails to get the amount of sleep he thinks he is supposed to have, based upon popular advice he remembers reading.

"…eight hours? I think that's what they tell you to have isn't it? Is it? I don't know. I'm sure that's what I've read somewhere you're supposed to have eight hours sleep and I think that's why I think it's the right amount to have, but I don't know…I try to but don't get it that often…" (S7: Daniel)

Another describes how he disregards information he has read in the media and bases his opinion on his own experience. This particular account bears similarity to those found in the scientific discourse, that on average that the human brain is programmed for 16 hours of wakefulness followed by approximately 8 hours of sleep across the diurnal day.

"I'd read in the paper that you don't need that much, but in my opinion…you need at least two hours of being awake to one hour being asleep in a day, in order to be active and to fully be able to concentrate…" (S5: Joseph)

Occasionally, advice the respondent had received in the past from parents or in school was drawn upon to justify their answer.

"It's been imprinted into me through my parents, through school, learning science and things about the body. I think it's the recommended time to have but I don't actually know where that's come from in me but for some reason eight hours is in me that's what I need to get." (S12: Chris)

Overall, sleep was understood as a period of social withdrawal. Whilst the majority of those interviewed attached importance to sleep, understanding it as a time during

which the body and brain relax and repair, many also considered sleep to be a waste of time, something which, if cut back on, would give them more time to do other things. Perceptions of an appropriate amount of and time to sleep were based upon experiential knowledge, parental advice, information in the media, and reference to science and psychology. Despite acknowledging various forms of normative advice about what is 'recommended', 'right' and what one is 'supposed' to do, sleep timing and duration were considered to be flexible and for the most part under individual control.

In ethical and media debates modafinil is positioned as enhancement technology in the student domain that will enable students to study for longer periods, stay alert during all night study sessions, perform better and be more alert in lectures (e.g. Greely et al, 2008; Cahill, 2005; Butcher, 2003; Farah, 2004). However, going beyond this, it was evident in the student data that work-life balance is extremely important to student in their successful adjustment to university life and importance is placed upon their successful engagement in social and recreational activities as well as academic performance. Theoretically, modafinil as an enhancement technology fills this niche requirement through the extension of wakefulness, therefore providing more time awake and alert to engage in both work related and recreational activities, and the enhancement of cognitive functions which could improve academic performance at the same time. The viability of such interpretations of modafinil will be returned to in greater depth later on. In the next section how students manage sleep and alertness in their daily lives is discussed before moving on to consider how uses of modafinil were understood in this social context.

Managing sleepiness and alertness

Despite a general overall conceptualisation of sleep timing and duration as somewhat flexible and under individual control, all of the respondents reported having experienced difficulties in getting to sleep or staying asleep at some point in their lives.

All respondents said that they sometimes struggled to stay awake and alert during lectures and had experienced 'mind black-outs' or 'switched off' finding it difficult to concentrate. Two-thirds of respondents reported that they had unintentionally fallen asleep while at university. As shown in the data extract below, some respondents blamed themselves for the difficulties they had experienced with sleeping or staying awake considering their behaviour to be the causal factor in the development of their sleep problems (e.g. inadequate sleep leading to lapses in alertness the following day). However, often respondents conceptualised such experiences not as problems with sleep *per se*, but as symptoms of other problems or factors. Examples given included: stress; emotional turmoil; lack of interest, activity or stimulation; and environmental factors (e.g. the lecture theatre being too warm or too dark). Biological factors were not a significant feature of student discourse. Problems with sleepiness/alertness were rationalised as a normal part of everyday life, and although unpleasant or undesirable behaviours, thought of as things that everyone experiences at some time or another.

"I do think that it's all my own fault because of the things I do. If I changed my patterns of my behaviours and stuff it'd probably change. But I wouldn't think of going to the doctor to be honest… I wouldn't want to end up on sleeping tablets…" (S7: Daniel)

In general sleep problems were not pathologised or medicalised in students' accounts. Respondents said that they would only seek medical advice for sleep problems if the problem persisted for a prolonged period of time and they could not resolve it in other ways. Many respondents were opposed to taking sleeping pills and thought this was all medical professionals would be able to offer them. Most said they would attempt to manage or 'cure' their sleep problems themselves first before going to the doctor. They would do this in various ways: by looking on the Internet for advice, trying herbal remedies, speaking to a family member or trying to change social or environmental factors they thought were causing the problem. Only one respondent had been to see

a doctor for advice about sleep problems, but was still cautious of pharmaceutical intervention in the sleep wake-cycle (S6: Louise).

Although falling asleep in public was generally thought of in humorous terms by students, it was problematised through its social unacceptability, often being referred to as 'stupid' or 'embarrassing'. A few students told scare stories about lecturers embarrassing students who had fallen asleep, saying this provided them with an incentive to try to stay awake during lectures. None of the students interviewed mentioned a concern that if they did fall asleep during lectures they may miss out on information or fall behind in their learning.

The majority of those interviewed said that they would try to stop themselves falling asleep in public during the daytime. Many of the students said they used caffeine specifically for the purpose of promoting daytime alertness or to help them wake up and feel more energetic when they were feeling tired or sleepy. In the data extract below the student describes how he uses coffee as a wake-promoting substance despite not liking the taste of it. He describes using caffeine to extend wakefulness when he feels under pressure, forsaking sleep in order to get his work done. Students described consuming caffeine in the form of caffeinated drinks and chocolate, although caffeine pills were also used by some students and were prominent features of student discourse.

> "I drink lots of caffeine…a few extra cups of tea or if I am feeling really pressured coffee - even though I can't stand the taste, but it keeps me awake more. That's usually what I do and just try and stay up longer, even if it is a case of getting not enough sleep - just to get [my work] done." (S1: Mike)

In addition to caffeine, students discussed various other methods they used to 'refresh' and 're-energise' themselves in order to aid concentration, promote alertness and help them focus. These ranged from doing something active such as writing notes

and drawing pictures while in lectures to taking a break, and included doing some mild exercise or having something to eat or drink (from high-sugar energy drinks to water).

"I try to write down notes to keep me alert - just to pay more attention on what's going on, whether I find it interesting or not. If I am free then I will go for a walk and that usually refreshes me. And I have a lot of coffee as well" (S2: Kerry)

Sleep was also discussed as an alertness promoting strategy. Many respondents discussed having a 'power nap' during the day as a strategy for promoting alertness or catching up on sleep if they felt that they had not had enough sleep the night before. Usually, this strategy would be used when the individual was at home rather than in a public space. Occasionally, sleeping in the daytime was thought of in negative terms, as disappointing and not how adults should behave.

"…when I've had four or five hours' sleep, I've just gone to sleep for an hour in the middle of the day, but I think that's pretty bad, because that's what newborn babies do! So I feel a bit disappointed." (S14: Susie)

Students' accounts revealed to what extent the use of an alarm clock as a wake-promoting technology or a way of truncating sleep is entrenched in everyday life. When asked if they did anything to help them wake up the use of an alarm seemed to be taken for granted. As shown in the data extract below most respondents did not mention that they used an alarm until specifically asked about it. All respondents reported using an alarm, usually one on their mobile phone, to wake them up after a period of sleep rather than leaving this to their body clock reasoning that they would not wake up at their desired time without using an alarm. Only one respondent spoke about his body clock waking him up. However, he still reported using an alarm for 'encouragement' (S5: Joseph).

S4: Emma: I always have a shower first thing in the morning, if I don't then I

feel like I haven't woken up properly. And breakfast. Never miss breakfast, but

no nothing more than that really.

Interviewer: Do you ever use an alarm clock?

S4: Emma: Oh yeah, yeah, alarm clock otherwise I probably wouldn't wake up!

To some extent through the construction of sleep as a waste of time the whole concept of sleeping was problematised. Although all students described how they would prioritise their waking activities and social engagements above sleep, only a small number of respondents expressed the desire to dispense with sleep altogether.

To summarise, all respondents reported having experienced daytime sleepiness to some degree, with a large number saying they had actually fallen asleep whilst working or studying. Despite this, to a large extent students did not problematise daytime sleepiness or impaired alertness in their accounts. Generally, levels of sleepiness and alertness were considered to be under individual control and individual responsibility. Falling asleep or feeling sleepy in the day was constructed as a normal response to boredom, lack of stimulation, lack of sleep the night before or due to particular socio-environmental factors. Daytime sleepiness was thought of in humorous terms, rather than as a medical problem. Through the construction of sleep as a 'waste of time' the idea emerged that if sleep could be dispensed with it would enable more time for one to engage in other activities.

Much like in shift workers accounts, sleep was understood by students in functional terms as a period of time for the body and brain to rest, repair and rejuvenate. Again, the acts of going to sleep and waking up were described as social activities, embedded in existing practices and privatised routines (Hislop & Arber, 2004); informed by social and cultural norms (Seale et al, 2007); experiential knowledge (Meadows, 2005); but perhaps to a lesser extent influenced by scientific understandings of the body. The extent to which students rely on existing technologies

to wake them up and promote alert wakefulness at personally desirable times was particularly striking. Notions of self-governance and individual responsibility for varying states of somnolence were dominant in students' accounts whereas biological explanations were rarely acknowledged. Although the university might not be considered a desirable location to sleep, falling asleep whilst at university was not considered an unusual occurrence. Although normatively speaking there might be a right time to go to sleep and a recommended amount of sleep to get, in contrast to shift workers accounts, students perceived sleep timing and duration to be flexible. They choose when they go to sleep and how long they sleep for, prioritising their waking life and fitting sleep in around both work related and social activities. In the following section the interpretation of modafinil as an enhancement technology in the student context will be critically evaluated.

Configurations of modafinil: Students as prospective users

None of the students interviewed had heard of modafinil prior to the interview. They were given details about the reported effects of modafinil and informed that it is currently licensed to treat various sleep disorders in which excessive sleepiness might be a symptom. Modafinil use was positioned in several different ways in student discourse. In this section the four most prominent configurations of modafinil will be outlined.

Modafinil as a medical treatment

Bearing similarity to the shift workers discourse (Chapter 6), students positioned modafinil as a medical technology. Legitimate users were identified as individuals 'in need' who had been designated as patients by medical experts and prescribed the drug by their doctor for the treatment of a recognised problem. In the student context, respondents tended to speak about students who suffered from concentration problems or low levels of alertness that might be holding the student back or

preventing them from 'getting the best out of their education' (S6: Louise). Modafinil was understood as a treatment for these cognitive impairments or deficits. Respondents reasoned that in these instances the student could be prescribed the drug by their doctor to regain a normal or authentic level of functioning, thus allowing them to 'reach their full potential' (S6: Louise).

Use of the drug by individuals who had been designated as ill or in need of treatment by the medical profession was referred to as 'a good thing' and understood as a sensible, controlled and careful method of relieving suffering and stopping inappropriate bouts of sleepiness. As illustrated in the data extract below, the medical profession were thought to be equipped with the necessary skills and expertise to identify legitimate patients.

"…a careful dose of this drug might help people…if it really helped them, it is a good thing, but obviously these kinds of things get abused as well, but doctors identify patients…" (S2: Kerry)

In this instance, passage through a medical encounter and diagnosis of a disorder were seen as legitimating use of the drug. Medical professionals were constructed as experts that 'know what they are doing' so would be able to restrict the use of the drug to those who really needed it and stop it being used for the wrong reasons by the wrong people.

"You wouldn't be abusing it if you actually went and you had a disorder and they said this is a remedy for it…" (S11: Stephen)

Although students commonly referred to the competence of medical professionals to decide who should and should not have access to modafinil, many of the students interviewed thought that taking a pill for this type of problem should be a 'last resort' to be used in times of crises or if the individual was experiencing severe problems or

distress rather than a first line intervention. To these respondents sleep was seen as a better way to promote cognitive functioning than taking a tablet, and fears were raised that something 'might go wrong' or the tablet might not work efficiently.

"I've not got time to be ill, I think sleep's a good remedy for everything, I'd rather do that than take a drug…I think only if I was having real bad problems I'd resort to that…" (S13: Nick)

Medical authority and expertise were valued highly by students with the majority claiming that they would not consider taking modafinil if it remained a prescription medication unless they had been prescribed the drug by their doctor, and that they would judge others for doing so. When presented to the user as a medical technology, medical control of a drug lead some to think that it was more 'serious' than OTC medications so should not be taken by everyone.

"If you can just walk into Boots and buy a packet then I'd think the experts have said they're all right so, why not? But no, if they were prescription only I'd see them as more serious and harsh and not for everyone" (S12: Chris)

However, other respondents thought that if students found out about this drug and really wanted it, they would get it regardless of whether it remained prescription-only. When modafinil was understood as a medicine, students typically argued *against* modafinil use by those without problems or impairments, drawing heavily on medical rhetoric, use of this kind was constructed as abuse of prescription medication. Users were reconfigured not as patients; but as cheats or abusers using the technology for the wrong reasons. Respondents reasoned that persons 'should only take medications if they are ill'(S10: Lizzy) or experiencing 'real problems' (S6: Louise) and that using the drug for these other more 'frivolous' reasons would be a waste of valuable medical resources.

"…people would use them for the sake of it and for very wrong reasons. That just because say they had a night out and they're really tired...I don't think people should do that." (S7: Daniel)

Most respondents thought that modafinil should remain a prescription drug, but wanted to evaluate the research themselves or wanted more research to be done to inform their opinion. This decision was often based upon fears of side effects later on in life, the potential harm the drug could cause both physically and mentally, risk of abuse and dependency. Some respondents reasoned that modafinil should be a controlled medication as the drug is still relatively new and the long term effects it could have on the body are not known. Others worried that even as a prescription drug, something might still go wrong or it might not work efficiently so should only be used as a last resort by those who really need it.

"Prescribed, because if you stay awake for 72 hours I am sure that's going to do something bad to your serotonin levels…you would then have people trying to exceed the dose to stay awake for longer than 72 hours" (S1: Mike)

Overall, students was thought it was 'obvious' that people who were suffering or had something wrong with them should have access to the drug through their doctor. It was feared that if modafinil was available OTC it would be open to abuse or 'overuse'; people might exceed the recommended dose, use the drug for 'frivolous things' or 'for the sake of it' such as staying up longer to work or going out with friends, which could lead to 'dependency', or lead to other health problems for the user. Getting more sleep was positioned as the 'right thing to do' even though most students acknowledged that they often did not get enough sleep. There are intentions designed into technologies, technologies come with scripts for use (Akrich, 1992; Latour, 1980; Woolgar, 1991). Because this drug is presently available as a prescription medication, its use to enhance wakefulness or cognition by students (without illness) was constructed as using the technology for the 'wrong reasons'. However, where to draw the line

between those who should be prescribed the drug and those who should not was identified as an ethical question.

Modafinil as a replacement for sleep

Secondly, students discussed the potential for modafinil to be used as a replacement for sleep. Two types of prospective user emerged in this frame: the social user and the anti-social (ab)user. For the social user, importance was placed on achieving a good balance between work and social life and modafinil positioned as a way to provide an 'extra boost' (S13: Nick) when needed. Drawing on the cultural idea of sleep as a waste of time, some respondents thought that potentially anyone could take modafinil as a way to extend the time available to them in a given day. Respondents thought that this aspect of the drug would appeal to individuals with demanding lifestyles, providing them with a release from the pressures of work through the provision of more time for social engagements. Some students thought that using modafinil for this purpose as a lifestyle choice that should be down to the individual to make, providing that safety and efficacy of the technology had been demonstrated through long-term studies.

"…it is quite difficult to juggle a heavy workload and a social life and people who work hard should be able to have a good social life, I think, so it would ultimately be up to them, but I think it'd be ok" (S6: Louise)

Another respondent goes one step further than this to imagine a purely recreational use of the drug. She imagines how one might use the drug as a way to replace sleep to gain more time or get more out of a holiday or short break:

"…you would have to sacrifice something if you're wanting to sleep. …if you're on holiday and you really liked it, if you were visiting a cultural city, it could be handy if you take those" (S14: Susie)

As discussed above, others constructed use of the drug by those without illness or impairment as an abuse of prescription medication. Alongside the figure of the social user an image of the antisocial user was also evident in the data. The 'antisocial user' was depicted as an individual who would abuse the drug and misuse the extra time afforded to them by using their extended wakefulness to 'cause trouble' (S8: Bella), commit crime (S4: Emma), or consume copious amounts of alcohol and be generally disruptive.

Respondents were cautious of both the effects of the drug and the effect that going without sleep could have on their health. Modafinil was considered open to abuse through the consumption of too many pills which respondents thought would lead to overexertion or damage to the body. It was feared that irresponsible users might become ill due to lack of sleep and burn themselves out. Although people could be informed about possible side effects of enhancement drugs, several respondents raised fears that some people would not take notice of health warnings and not care what happened to them in the longer term. They used this to argue that modafinil should remain a prescription medication and not be available to all as a replacement for sleep. As in the account below, some students took a different stance to this and argued that there are always going to be people who will abuse substances but considered this too as an individual choice. Here the respondent reasons that if people do decide to use the substance against expert advice they would be responsible and culpable for the consequences of their actions. He did not consider the potential for modafinil to be abused as a valid reason to restrict access to the drug.

"I don't think you should restrict the majority of people from having a useful benefit from it to the minority who are going to abuse it - because it is their choice. If they are informed about it and then they go on to take more than the recommended amount and have a side effect from that, that's their own fault really" (S1: Mike)

Another respondent reasoned that as adults, individuals are capable of making their own choices about their lifestyle and consumption. He argues that most adults would be responsible enough to not abuse the drug knowing that it is not normal to stay awake for days without sleep (S12: Chris) . Others feared that use of the drug to replace sleep could turn out to be addictive or habit-forming, if not biologically then socially, reasoning that once someone has got used to not having to sleep it might be difficult to go back to sleeping as they would feel like they had 'so little time' (S7: Daniel) . Respondents referred to the importance of sleep for rest and recovery and argued that if individuals conducted their lives in an appropriate way (e.g. by sleeping at night as opposed to socialising) there would be no need to take this drug.

> "…for general people they shouldn't need it if they go about their life as they should do…if they don't go out all night then they should really have enough energy to stay awake all day." (S4: Emma)

Some respondents thought that it would be interesting to experience a prolonged period without sleep and this function of the drug seemed to really appeal to them. However, in general, the benefits of chemically extending wakefulness were treated with scepticism. Most of the students interviewed treated modafinil with suspicion, saying it sounded like a 'wonder drug' (S5: Joseph) and 'too good to be true' (S14: Susie; S11: Stephen). When configured as a replacement for sleep, modafinil was compared to existing recreational drugs, such as cocaine, ecstasy and alcohol, as opposed to foodstuffs or other medicinal drugs. As with use of these substances, many respondents doubted that the process of extending wakefulness would be beneficial to their health. Drawing on an understanding of sleep as a period of repair and restoration, the chemical enhancement of wakefulness was commonly approached with caution. Students reasoned that going without sleep would have 'a consequence, somewhere' (S14: Susie), that there were 'too many unknowns' (S2: Kerry) and that one should be wary of drug use for this purpose. It was argued that all drugs have some negative side effects and even if there have not been any major side

effects reported to date, something might go wrong or there might problems in later life.

"I'm slightly suspicious of it for some reason…it sounds too good not to have something bad, like, if someone hits forty and then just want to sleep all the time or becomes ill" (S14: Susie)

Arguments against the use modafinil to replace sleep also appealed to ideas about the natural body, control over bodily functions, natural rhythms and patterns of sleep. Appeals to the 'natural body' were used to argue that the body needs sleep in order to function, and although acknowledging that they often go without adequate sleep, this was seen as unnatural. Interfering in the body's natural 'rhythms', 'roles' and 'routines' was generally viewed as 'not a good thing'. Many thought that the (ab)use of prescription medication by those without illness would ultimately be detrimental to health and could lead to dependency which would not be worth it just to have a better social life, not be tired or to perform better at work.

"I wouldn't want to interfere with the natural rhythm…even if they said 'this drug hasn't got any side effects' I don't know whether it is natural to interfere with these natural patterns of sleep." (S2: Kerry)

It was argued that people should live naturally and if someone has not had adequate sleep due to their social life, it is their own fault and they should suffer the consequences of their behaviour rather than take a drug to counter its effects. As explained by the respondent in the passage below, as a student it is your own fault if you are not alert because you have chosen to not get enough sleep.

"…just because you've had a night out, it's your own fault for going out so therefore you should suffer with the consequences of not getting sleep" (S10: Lizzy)

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The social changes imagined by respondents if modafinil was to be used as a replacement for sleep were plentiful. Collectively, respondents accounts depicted a strange new world without time cues, extended working hours, higher levels of earning and spending, increased engagement in (anti)social activities and higher levels of illness. In contrast to visions of the future often found in neuroethics papers, students imagined that although less sleep would give people more time, this would give people more time for social activities and enable them to have more fun (go shopping, meet friends, watch more television) as opposed to more working time. They also thought that more time awake would create financial pressure on individuals as they would need to eat more often, heat their homes during the night and have more opportunity to spend money. Students envisaged that extended wakefulness could have detrimental effects on social relationships (too much time together causing strain) and that increased noise and activity during the night could cause disruption to those who did choose to sleep (S9: James).

"…if people were using it solely to stay up longer and have more fun, then that might lead to it not being a highly productive society." (S6: Louise)

Far more fears and concerns were raised at every level than potential promises for betterment. It was feared that people would take advantage of the drug, so that they never needed to sleep. Several respondents clearly thought that using modafinil for this purpose would be 'a bad thing' (S8: Bella), that it was 'unnatural' (S2: Kerry; S8: Bella; S9: James; S13: Nick) not to sleep and such usage would make those individuals 'not normal for a while' (S10: Lizzy). In the extract below, the respondent imagines how access to the drug could even encourage students to go without sleep. She discusses how going without sleep appears 'harmless' because people 'already do it anyway' and fears that the availability of wake-promoting technology could reinforce this view. She thinks that in going without sleep people might be missing out on something important.

"…people'd be more inclined to go out…they'd think 'I can out because I know I can stay awake the next day'…people say that dreaming is quite important…if you're not sleeping then obviously you're not going to dream as much" (S8: Bella)

She then goes on to say how the availability of this technology could change cultural understandings of sleep resulting in sleeping being considered as a negative behaviour. Respondents feared that in a world with no set sleeping patterns, sleeping would be thought of as unnecessary, as something you do if you are lazy rather than a biological need.

"…sleeping will be seen as something that you do more if you were lazy rather than a natural thing that you need to do, because you could take [modafinil] and stay awake" (S8: Bella)

Others spoke about how degradation of the day/night divide could lead to cultural changes fearing loss of cultural rituals and collective identity. They feared that the loss of time cues could lead to difficulties in knowing when it is acceptable to engage in particular activities or behaviours, such as calling a friend or when to have breakfast, as everyone might be sleeping at different times. More people could be coerced into working longer or later, thus fuelling an ever increasing cycle of drug use. Some respondents said they would not be surprised if this did occur in the future, linking less sleep to more time, and more time to more money (S13: Nick). In the data extract below, the respondent is both excited and saddened by the idea of a 24 hour world:

"It is a very exciting idea of the twenty-four hour world, but at the same time I think is that going to be a loss of identity and sort of a cultural thing…it wouldn't be like 'oh we have this special meal at this special time' because that would have gone…" (S3: Dave)

Many thought that the changes they envisioned occurring would not be instant and would probably happen with or without this technology. One respondent compared prospective changes to society to the image of 24 hour living in cities such as New York to argue that although more people might be awake at night, things could just balance themselves out and life might not be that different to the way it is now (S14: Susie). Another respondent reasoned that the world is still going on around you when you sleep, so being awake for longer would just enable you to engage in what is already happening (S5: Joseph). It was frequently pointed out that many businesses and big cities are gradually moving towards 24 hour living already. References were drawn to the rising global economy to argue that in some respects we are already a 24 hour world, and that our use of electric lights has already eliminated the traditional reason why we went to bed at night.

Overall, on a personal level, the majority of respondents said that they would be unwilling to use modafinil as a replacement for sleep. Use of the drug as a replacement for sleep was considered recreational as opposed to medical: a way to increase time awake and optimise ones work-life balance. However, the acceptability of using the substance in this way and for this purpose was strongly debated amongst the students interviewed. While some students reasoned, that provided the individual had access to all the relevant information, as responsible adults they should be able to choose whether to use the drug for this purpose, others were far more cautious of using the technology to replace sleep, conceptualising this as 'abuse' of prescription medication. Students' concerns centred on possible risks to health going without sleep might lead to, social addiction to the drug and potential for it to be abused. They were sceptical of the proposed benefits of drug use, arguing that the potential health risks are not 'worth it' and it is 'better to avoid drugs'. They often proposed that mandate via medical prescription would be a good mechanism to prevent abuse, overuse of the drug and the detrimental impacts this could have on both an individual and a social level.

Modafinil as a substitute for caffeine

When discussing the appeal and possible circumstances in which modafinil could be used by students, similarities were often drawn with past experiences of using existing technologies or strategies to promote alertness and extend wakefulness. Students frequently drew analogies between modafinil and caffeine pills, framing modafinil as a substitute for caffeine, a drug which, in their accounts, is already widely used by the student population to improve cognitive performance and promote a wakeful state. Within this understanding, modafinil was positioned as a new and improved version of technology that already exists and use of this drug was considered to be just the next step in an already established practice of promoting alertness. Furthermore, modafinil was considered to be a more appealing substance than existing caffeine-based products due to its promise of not only enhancing wakefulness but also improving cognitive abilities.

> "So many people use [caffeine pills] that I think after a while they'll realise oh well [caffeine pills aren't] doing that much so we'll go on to this next tablet which not only'll make me like more active, it'll change my cognitive abilities. So yeah I think there'll be quite a big demand" (S7: Daniel)

Through comparisons of modafinil with foodstuffs such as caffeine, its use was generally understood within a framework of consumption and consumerism and positioned as a 'lifestyle choice' that would be down to the individual consumer to make. Around half of those interviewed said they would consider using modafinil as a substitute for caffeine pills and many others asserted that even though they might choose not to take either substance, they would not judge others for doing so. It was assumed that students whom already consume caffeinated products and like substances to promote wakefulness would probably take modafinil for the same reasons and in similar situations. Through reference to the current popularity of caffeine tablets and the ready consumption of other OTC pharmaceutical products,

such as painkillers and diet pills, most respondents assumed that wake-promoting drugs would have a ready market that would gradually expand as the technology became more known.

"Some of my friends take caffeine pills anyway so they could do all their work during the week and then go out at the weekend and hold down a job…I would think it was an interesting lifestyle choice, but I probably wouldn't judge them for it" (S3: Dave)

The drug was not uncritically accepted though, as illustrated in the data extract below, fears were often raised over possible tolerance, dependency, side effects use could have and addiction to the drug.

"…I don't know whether that drug would have the same effect whether if you took a lot of it you'd just start to ignore it. It definitely happens with the people [who take caffeine pills], it just doesn't affect some people any more' (S4: Emma)

Those who said they would take it provided several caveats: that it was affordable; it did not disrupt their sleep patterns later on; that they were fully informed about the side effects so could 'weigh up the pro's and con's'; they knew what the ingredients of the drug were; and that they would not become reliant on it. If these conditions were met some imagined themselves taking modafinil under specific circumstances, while others thought they would take the drug 'all of the time' (S1: Mike). Despite fears being raised over potential side effects or addiction and respondents wanting more information about the drug, the use of modafinil as a substitute for caffeine was generally thought to be acceptable by most students, if 'experts' had sanctioned it as safe for OTC use.

Children (or other individuals who are not responsible for their own decisions, e.g. dementia patients) were however, depicted as illegitimate users of the drug. The use of the drug by children sparked fears that children might not be able to physically or mentally cope with extended wakefulness and alertness, thus taking the drug would pose a risk or danger to health; the potential for 'pushy parents' to force their child to stay awake longer to pursue additional educational activities; and also the strain extended wakefulness could put on family relations. All respondents agreed that if modafinil was to become available OTC, it should only be available to adults.

In this configuration of technology and user, visions of a radically different future world were scarce. When modafinil was aligned with caffeine the social impacts of it use were rarely discussed. Some respondents reasoned that if modafinil and like substances were to be used in future in the same way caffeine products are presently used, the availability of this technology would not have much of an impact on society (S11: Stephen).

When likened to caffeine, modafinil was understood within a framework of consumption and lifestyle choice, as opposed to medicine, therapy or enhancement. However, clearly, this form of pharmaceutical consumption could be described as cognitive enhancement as the substance is being used with the goal of extending or improving mental capacities in the absence of illness, disease or disorder. Interesting questions arise here as to why this type of use was not considered to be controversial or even a form of human enhancement by prospective users.

Modafinil as a study aid

In the student discourse, discussions of modafinil as a performance enhancing substance were much more prominent than in the shift worker data. Modafinil was often discussed in relation to its potential to be used as a type of study aid in the student domain. Respondents envisaged students using the technology for the

purpose of performance enhancement in several situations. These included: during exams; when revising or writing an essay; when they were feeling stressed or under pressure; on long days; for all-night study sessions; or if they felt their work was going badly. Students gave various reasons for why they might use modafinil in these situations: to improve concentration or memory; to calm them down and relieve stress; or if other people were taking them so not to be disadvantaged or left behind.

The use of modafinil as a study aid was generally thought to be a controversial practice by the students interviewed. Most respondents thought use of the drug as a study aid would be acute and under these specific circumstances (as shown in the extract below). However, a small minority of those interviewed thought they would probably end up using this technology all the time in order to improve their academic performance.

"…if you had a period where you had a lot of course work to do or an exam period something like that would be really tempting…you probably don't need it on a daily basis." (S3: Dave)

Several respondents alluded to the temptation built into enhancement technologies arguing that when faced with the choice, most people would prefer to perform better as an individual. Positive impacts of this technology were imagined in terms of health, wealth and productivity, provided the technology was available at relatively little cost. In fact, two thirds of students interviewed said they would be more tempted to take modafinil for its prospective performance enhancing effects than as a replacement for sleep. Opposition to cognitive enhancement as a concept was fairly weak and instead students' accounts were dominated by intrigue and temptation. Despite this, in general, the enhancement potential of the drug was generally treated with scepticism. After being informed about the cognitive enhancing properties of modafinil, some thought that the drug sounded 'too good to be true' or like a 'miracle drug' and

doubted whether it really was that 'wonderful', questioning safety, efficacy and other effects it could have.

"I would have to find out about that drug, what it really does beforehand - it sounds a bit like a miracle really. I would have to do a lot of research before taking it. It sounds too good to be true" (S2: Kerry)

Again, some students considered the use of modafinil as a study aid by students to enhance cognitive performance was constructed as a personal choice that should be down to the individual to make.

"I probably would consider it as long as I knew the side effects. I know some people take tablets if they're going to work all night…as long as I knew and weigh up all the pros and cons of it then yeah" (S9: James)

Through making the choice to use a chemical study aid, the individual was thought to be responsible for any potential risks to health they might be exposing themselves to in the process.

"…if they take the risk to live with the side effects then that is their business really" (S2: Kerry)

Others equated modafinil use as a study aid with cheating, in that using such a drug would enhance one's cognitive performance, and thus provide the user with an 'unfair advantage' over other students who had not taken the drug. Occasionally, taking modafinil as a study aid was compared to professional athletes taking enhancing drugs to perform better in competitions and the same judgement made. Measuring performance against natural ability, some respondents reasoned that if one performs better with the aid of a chemical enhancement than one could without taking the drug, this would be cheating.

"Depends if they'd done better than me or not. If they were still at the same kind of level then it wouldn't be too bad I suppose, but it would feel like they were cheating, because it's not fair natural ability…" (S8: Bella)

Others argued that if enhancement drugs were widely available to everyone their use to aid study would not constitute cheating.

"If it's available to everyone then is it cheating? Because, if everybody could go down to the chemist and get these drugs, then surely it's just a choice?" (S3: Dave)

Efficacy and availability were both important factors in whether using the drug as a study aid was considered acceptable or not. Respondents were concerned that if the drug worked better in some people than others, or if some individuals suffered an adverse reaction to the drug so were not able to take it this could cause disparities between those who use the drug and those who do not.

Even if the drug remained prescription only, some students feared that people may still try to use this substance as a performance enhancer. In the data extract below the respondent describes how students might try to obtain modafinil via deception, through faking illness. He reasons that if the drug remained a prescription only substance, taking modafinil to enhance cognitive functioning would be providing the individual with an unfair advantage over others.

"If they were faking symptoms to get hold of them, so were being falsely prescribed them then I would probably be a bit miffed about it" (S1: Mike)

Whilst some respondents thought only those students who felt they needed help to get their work finished would be the ones drawn to the drug, others were concerned that although they personally would not want to use the drug as a study aid, they would

feel pressure to take the drug to keep up, especially if their friends were taking it and reporting positive effects. Respondents feared that objection to drug use could put some students at a disadvantage. Further concerns were raised that drug use could become standard for optimal performance and the potential for students to become reliant on such a substance, around exam times for example. Respondents feared that users might become tolerant to the effects of the drug, and that regular drug use could lead to dependency.

"If people become dependent on it to be able to actually function properly it is going to be like any other sort of drug addiction, you might get hooked on it and even if it isn't physical - it might be that they feel they have to have it to function properly" (S1: Mike)

The risk of side effects, either in the short or longer term, affecting one mentally or physically, featured heavily in student's deliberations about the prospective use of modafinil as a study aid. All respondents said they would consider the side effects of the drug before deciding whether they would take it for this purpose. The case of the morning sickness pill thalidomide was used to tell a moral tale about pharmaceuticals and illustrate that even if new pharmaceuticals are tested properly and come to market, it is never absolutely certain that nothing will go wrong. This moral tale was used to argue that 'there should never be the requirement to take something to make you better than you are' (S8: Bella).

Legality of substance use also emerged as an important consideration in students' accounts. Most respondents said that if modafinil or related substances were available OTC, that they would not judge other students for taking them, provided that they were legally allowed. As in the interview extract below, most students said they would only use the technology as a study aid provided that it was legal and not breaking any rules.

"As long as there was nothing to say that you shouldn't, then yeah…if they invented a drug and then it became illegal then I wouldn't be taking them" (S9: James)

However, understandings of modafinil use as an 'enhancement' in the student domain were problematised by several individuals who thought that using the drug would imply they had a problem, inadequacy or inability to cope. This raises questions about the definition of modafinil use as enhancement, as if there has to be a problem for use to be justified- can drug use still be thought of as an 'enhancement', or does it become more therapeutic and restorative?

"…everyone would prefer if they could concentrate more and perform better, but…I still wouldn't want to do it because it's basically implying that you can't cope with being able to concentrate yourself, which is kind of saying that you've got problems." (S5: Joseph)

Another respondent described how she would feel pity towards those students who were not alert enough to take an exam without using a drug.

"I'd feel a bit sorry for them that they couldn't just do it without [drugs] and that they're not actually alert enough to take an exam without stimulants." (S4: Emma)

In summary, in its configuration as a study aid, respondents' opinions clashed as to whether the users of modafinil should be thought of as ambitious and competitive individuals striving to get ahead or cheats abusing or misusing the drug to gain an unfair advantage over others. Safety, efficacy, fairness and legality of substance use emerged as prominent ethical and social considerations related to this type of usage. Often it was other concerns and considerations, for example, fears surrounding potential health risks that lessened the appeal of modafinil rather than any ethical

objections to the chemical enhancement of cognition. Despite much scepticism that the drug would be an efficacious cognitive enhancer, most respondents said they might still consider trying it, provided they could find enough information to reassure them it would not be harmful and there was nothing to say they should not use it.

Summary and conclusions

In student discourse, student life was depicted as varied and flexible. Tension was observed in the data between two different, yet overlapping, understandings of sleep: sleep as a period of rest and relaxation that is natural and vital to health and wellbeing; and sleep as an inconvenient waste of time that can be dispensed with. Although students considered sleep to be important and acknowledged various forms of normative advice about sleep, work-life balance was prioritised in their accounts. All of the students interviewed admitted that they cut back on sleep for education, employment or recreational purposes. Sleep timing and duration were ultimately considered to be flexible and for the most part under individual control.

Descriptions of complex social and technological networks utilised in order to control sleep and enhance alertness in daily life featured strongly in the data. The extent to which students rely on existing technologies to wake them up and promote alert wakefulness at personally desirable times was particularly striking. Individuals demonstrated a wealth of lay knowledge and expertise governing their own sleepy bodies and cognitive functioning through a variety of technologies including the regular consumption of OTC pharmaceutical products and food-stuffs to negotiate sleep, work and health in their everyday lives. This was considered the norm and not of social or ethical significance. Although problems with sleepiness and alertness were well documented and medical expertise was valued and respected, typically, students' own sleep problems were not pathologised or medicalised in their accounts. In addition, there was little concern that lapses in attention would cause them to miss out on aspects of their education.

Four complex modafinil/ user configurations dominated students' accounts. In each of the four configurations discussed, the use of the technology was framed in a slightly different way, and the user assumed to have a different set of motivations and intentions for using the drug. By consequence, each configuration came along with its own set of social and ethical considerations which influenced the perceived acceptability of modafinil use in each case. When modafinil was discussed as a technology that can be used outside of medical control, students debated the legitimacy and acceptability of using the drug to improve individual performance and capacities, or for recreation and pleasure seeking activities. Configurations of modafinil as a substitute for caffeine or a replacement for sleep were intertwined with notions of consumerism, individual responsibility and lifestyle choices. When framed as a study aid modafinil use was thought about in terms of performance improvement. When understood as a medicine, bearing similarity to shift workers accounts, modafinil use was constructed in relation to notions of normality, health and illness which were used to legitimate drug use. However, concerns over safety of the drug, future health risks, possible addiction or dependency to the drug were prominent elements of all configurations. Legality was also an important consideration and featured strongly in the justifications both for and against drug use that were given.

As in the shift workers discourse, imagined users of and uses for the drug were embedded within narratives about past technological failures, existing technologies and other strategies for cutting back on sleep, promoting wakefulness and improving cognition, and elaborate visions of the future. These strategies functioned as rhetorical devices for students to explore hopes, promises, concerns and fears surrounding the availability of a new technology that could potentially be used to control sleep and enhance cognition (Borup, 2006; Brown & Micheal, 2005). Respondents envisaged how the use of enhancement drugs could impact on individuals, families, British society and culture. They imagined both positive and negative impacts this new technology could have, although in most cases their fears and concerns far outweighed any hopes and promises that were expressed. Interestingly, when asked

what impacts they thought this technology could have on society, it was the wake-promoting effects of modafinil that fuelled visions of the future. The potential impacts that the cognition enhancing effects of the drug could have on society were rarely mentioned.

Modafinil was introduced to students as a prescription drug and despite the different uses and users that were imagined, most respondents returned to this configuration in their assessment how the drug *should* be used. In their accounts passage through a medical encounter and diagnosis of a disorder were seen as legitimating use of the drug. Therapeutic use was clearly differentiated from an enhancing use of the drug. Users of the drug who were not considered to be ill or impaired were typically reconfigured not as patients; but as cheats or abusers using the technology for the wrong reasons. Further to this, the whole idea of enhancement in the student domain was problematised to some extent with some students reasoning that the use of a drug to improve alertness or performance would imply the existence of a problem in the first instance.

Contrary to this, it was also evident that modafinil does fit into existing ways of managing sleep and wakefulness outside of medical control, especially when configured as a substitute for caffeine. In this instance the technology was easily assimilated into existing socio-technical networks and an existing user group readily imagined. When modafinil was positioned alongside existing wake-promoting technologies such as caffeine, it was thought about in a framework of consumption and lifestyle choice, as opposed to medicine, therapy or enhancement. Clearly this form of pharmaceutical consumption could be described as cognitive enhancement- as the substance is being taken with the goal of extending or improving mental capacities in the absence of illness, disease or disorder. Such usage was not considered controversial by prospective users, providing that safety and efficacy of the technology could be assured. In fact, opposition to cognitive enhancement as a concept was fairly weak and instead students' accounts were dominated by intrigue

and temptation. Often it was other concerns and considerations, for example, fears surrounding potential health risks that lessened the appeal of modafinil and promoted calls for it to be under medical supervision rather than any ethical objections to the chemical enhancement of cognition.

Respondents were unsure as to whether modafinil should be made available to students, even in the case of those students who said they would take the drug and thought they would benefit from it. The dominant position adopted in the data was one of deference to medical control. Respondents concluded that as long as scientific and medical experts believe the technology should remain prescription only, it should only be used to treat illness.

The data presented in this chapter has demonstrated how the same technology could potentially be used in several different, perhaps even contradictory, ways and for several different purposes in one specific domain of social life by one prospective user group. The sociological analysis of rituals and routines was important in understanding how new technology as either medical intervention or OTC consumer product fit into the everyday lives of prospective users. Of significance in the data was how several of the purported uses and frameworks within which drug use was understood fall outside of the therapy-enhancement dichotomy that structures the ethical and to some extent, media debates about cognition enhancing drugs. It was evident that technologies come with scripts for how and by whom they should be used (Odshoorn & Pinch, 2006). Although alternative uses for the technology can be easily imagined and such scripts can be re-written by the user (Akrich, 1992; Mallard, 2005), it is apparent that the way in which new technologies are framed and made available to prospective users has a strong impact on the way use is understood and the intent behind use is rationalised. This also impacts upon the normative judgements made and perceived acceptability of their use.

Chapter 8: Conclusions

Introduction

Informed by previous work in both medical sociology and neuroethics, the aim of this thesis is to explore the social and ethical issues relevant to the pharmaceutical augmentation of human cognitive functioning. An STS perspective was adopted and the wake-promoting drug modafinil used as a case study to determine how sociotechnical spaces for 'therapy' and 'enhancement' are being constructed and negotiated in different domains of social life. The core research question this project aims to address is: How is the use of the drug modafinil to augment human cognition understood within the mass media, by researchers and potential users, and what implications does this have for debates about enhancement technologies?

The study attempted to: establish the ways in which modafinil is represented in the mass media and how this impacts upon views of the legitimacy of its use across different contexts; describe how the use and users of the technology are framed within medical and scientific discourse; analyse the ways in which prospective users of modafinil understand, position and negotiate use of the drug in the context of their everyday lives; and to explore the implication of these empirical findings for normative debates about the idea of cognitive enhancement and social science debates about (bio)medicalisation.

The aims of the study were operationalised into specific research questions. These included the following: How are sleep, cognition and the body conceptualised in different social contexts and by different stakeholder groups? How is modafinil use understood, positioned and negotiated in each of these domains? What sociotechnical scripts are associated with modafinil use and how is it positioned as a medical or non-medical technology? According to what norms do different groups believe that

augmentation of the mind should take place? What role is given to medical authority in deciding if particular uses are acceptable?

This chapter aims to draw the empirical findings of the study together and assess if, in the light of these empirical findings, the maintenance of a therapy/ enhancement dichotomy remains viable when discussing the various uses of cognition enhancing drugs and to discuss the implications of these findings for the process of (bio)medicalisation.

Summary of findings

Empirical work was conducted in two stages. Firstly, frame analysis using a metaphor-based approach was used to analyse media data to uncover the cultural framing of modafinil. Use of the drug was situated within four discursive domains in the media: patient, sports, recreation and work. Each discourse was built up around the specific deployment of the metaphorical frames 'war', 'commodity' and 'competition' that impacted upon how modafinil use was portrayed in terms of therapy or enhancement and the level of engagement with a medical rhetoric. The media analysis clearly demonstrated the importance of social context when considering the socio-ethical implications of new technologies. The war frame dominated patient discourse in which use of modafinil was framed in exclusively medical terms as a legitimate and desirable way to fight sleepiness. Through competition metaphors use of modafinil in a sporting context was heavily criticised and depicted as an illegitimate performance enhancement falling outside of medical authority. Use of modafinil in the workplace and use in a recreational context emerged as boundary cases, where use of the drug was framed as neither exclusively therapeutic nor enhancing and normative reaction was mixed.

Secondly, informed through the results of the media analysis, interviews were conducted with three stakeholder groups in order to further explore modafinil use in

these boundary cases. A wider discursive approach drawing on elements of frame analysis and grounded theory was used to analyse interview data.

Scientists and clinicians were interviewed who were familiar with the use of drug in either a research or clinical setting to investigate the scientific and medical framing of modafinil. Modafinil was positioned as a therapeutic substance by sleep experts that should be under medical authority and control. All uses of modafinil outside of medical control that were imagined were constructed as illegitimate uses of the drug, usually on the grounds of risks to health unmonitored or unregulated use of the substance could have. Surprisingly, the war frames dominant in media discourse were rarely found in medico-scientific discourse. Instead sleep experts tended to frame sleep disorders as bio-psycho-social problems. Although the biological body was usually spoken about through the use of biomedical language, the socio-cultural context in which sleep disorders arise, are defined and become problematic for the individual (as biological, psychological and/or social problems) was overtly referred to and recognised. This was reflected in how modafinil use was understood and positioned by the expert community. Rather than framing modafinil as the optimal way to fight sleepiness and regain normality as was the case in the media discourse, sleep experts constructed modafinil as a short term medical solution that could help some individuals depending on their particular biological problem, social situation and personal preference.

These findings suggest that many human behaviours and functions associated with sleep and cognition are indeed being colonised by various forms scientific and medical expertise (Williams, 2002; Conrad, 2007), defined in biomedical terms and subjected to biomedical interventions (Fox & Ward, 2008; Moirea, 2006; Dement & Vaughan, 2000). Despite this, a number of alternative but complementary explanatory models co-exist and are supported within the domain of scientific medicine. These models combine knowledge claims from the different 'expert' disciplines (e.g. neuroscience, genetics, psychology, psychiatry and so on) to explain the nature of sleep and

cognition problems and suggest strategies for their management or resolution, perhaps reflecting claims that biomedical knowledge and practice have a rather more 'diffuse and distributed' nature than is often acknowledged (Weiner & Martin, 2008; Pickersgill, 2009).

Interviews were also conducted with shift workers and students who were depicted as existing or future users of the drug in media and bioethical debates. Interviews with prospective user groups aimed to situate understandings of and attitudes towards modafinil use in social context in an attempt to further explore the emerging social and ethical issues as defined by potential users. Again, the strong metaphorical references to war, commodity and competition found in the media debates were largely absent in the talk of potential users.

Overall, modafinil use and users were configured in many different ways by those interviewed. The four most prominent configurations found in the shift worker discourse positioned modafinil as: a medicine, an OTC pharmaceutical product, a safety tool, and a performance enhancing drug. In the first two of these configurations, modafinil was constructed as a treatment (whether administered by a medical professional or accessed independently) for those with impairments or clinical disorder. In both instances, use of the drug was conceptualised as acting to restore impaired functioning and return the individual to a normal level of health. Alternatively, when configured as a safety tool, modafinil was understood as a way to boost cognitive performance, alertness and reduce tiredness, but as a means of achieving higher levels of safety, rather than performance, in the workplace.

Four configurations of modafinil use and users also dominated students' accounts. Modafinil was positioned as: a medical treatment, a replacement for sleep, a substitute for caffeine, and a study aid. Student discourse was dominated by notions of autonomy and the idea that the individual is responsible for their body and its functioning. Respondents understood sleep, bodily functions, cognitive performance

and selfhood to be flexible, under their own volition and control. Within this worldview, non-medical use of modafinil use was typically referred to a lifestyle choice. Regardless of their personal inclination to take the drug, respondents thought that if provided with enough information individuals should be able to weigh up the potential benefits against potential harms and choose whether or not to use the drug as a replacement for sleep or as a cognition enhancer, provided that the substance was freely and legally available OTC. Often other concerns and considerations, for example fears surrounding potential health risks, lessened the appeal of modafinil rather than any strong ethical concerns about use of pharmaceuticals to enhance cognition. Although individual autonomy, choice and responsibility for health and performance were dominant themes in the student data, medical authority and expertise were also respected and valued. Consumption of medical technology for purposes other than healing was regularly thought of as abuse of medicine rather than enhancement, clearly illustrating the cultural power of medicine in defining legitimate spaces for drug use in British culture.

Nisbet and his colleagues argue that the way in which news media frame scientific issues can directly influence public opinion (Nisbet, 2007; Nisbet, Scheufele et al., 2002). Of interest for this research were the messages, behavioural directives and bodily narratives that were being made available in the media rather than how this information was received or understood by an audience. However, this study found that the language, frames and particularly the metaphors used in media discourses were largely absent in the talk of those interviewed. Although this finding could call into question the influence of media framing on the way the 'mass public' perceive and evaluate scientific information, further research clearly needs to be carried out in this area. Alternative explanations for this disconnect are possible, media coverage of modafinil has not been extensive to date and many respondents had not heard of the drug prior to the interview so it is unlikely they would have been exposed to the media discourse surrounding it.

To summarise, the analysis of the ways in which modafinil use was positioned and various uses were negotiated in both media and stakeholder discourse shows how different groups can conceptualise the same technology in very different ways depending on who is doing the defining, who the imagined users are, the purpose for and specific context of use. The implications that these findings have for the therapy/enhancement distinction upheld in neuroethical debates about human enhancement will be returned to later. In the next section the ways in which modafinil use and users were conceptualised will be discussed in more depth.

Drugs, culture and scripts for use

The notion of the technological script is well-established within STS. This study has attempted to apply the idea to pharmaceutical drugs rather than computers, speed bumps, or door closers (Latour, 1992; Johnson, 1988; Winner, 1980; Woolgar, 1991). From an STS perspective, for successful integration, a technology must be built in conjunction with an environment in which it can function. In other words, for a technology to be successfully adopted in a particular social context it must be constructed in conjunction with that context in which it must become the right tool for the job. As technologies are designed, developed and used in the social world, in order to study the prospective uses of modafinil, it was both important and necessary to first uncover the complex social and technological networks already utilized in order to control sleep and enhance alertness in daily lives of citizens.

The STS framework adopted to analyse modafinil as a wake-promoting technology in its imagined contexts of use therefore took into account: the society and network of artefacts within which the technology would be embedded; how potential users 'read' the technology and its configurations; and how putative users and the future impact of their likely actions were configured in the process. Particular attention was given to the ways in which socio-ethical dilemmas regarding the uses of psychopharmaceuticals arose and were resolved (if at all) in visions of a 'cognitively enhanced future'.

Configuring the technology and the user

From the analysis conducted it appears that drugs are not only embedded with technological scripts for how and by whom they are to be used (Akrich, 1992), but also strong cultural scripts relating to legitimacy and acceptability of when, where, for what purpose they *should* be used. As imagined and reported in media and bioethics discourse, pharmaceuticals such as modafinil could potentially be put to many uses throughout various domains of social life (Lakoff, 2005). However, even though this might be the case, technologies are not neutral artefacts (Winner, 1980). Medical technologies embody various social and cultural understandings of the kinds of bodies they are interacting with, the disease, illness or trait being targeted, and what is normal or desirable (Nichter & Vockovitch, 1994). They are designed and developed for specific uses with a specific group of users in mind (Woolgar, 1991). Modafinil was, first and foremost, developed under stringent regulations as a medicinal product to be used under medical supervision for the treatment of a specific symptom of one or more medically defined disorders. It exists in pill form, is packaged in a small box which includes instructions for how and by whom it should be used like other medicinal products, and is usually dispensed by a pharmacist in the UK upon receipt of a medical prescription.

This configuration, of modafinil as a medicine and users as patients who have been assessed and prescribed the drug by a medical professional, was found to some extent across the discourse of all three stakeholder groups interviewed and in the media data. In the scientists' discourse this was the dominant configuration of modafinil. The drug was clearly configured as a medicine which should be used to treat or protect against ill health, legitimate users were identified as patients and all other uses outside of medical authority considered as being abuse of prescription medication.

Although alternative scripts for use were acknowledged and discussed by scientists and clinicians, reading the technological script of modafinil in this way clearly defined the drug as a medicinal, therapeutic substance whilst at the same time excluding other possibilities of use on a normative level. Chemical augmentation of brain functioning was only viewed as acceptable when following medical norms that set standards of health, illness and normality. Visions of the past and of the future guided responses in this domain. Some respondents drew on stories of drugs that were once thought to be safe but later turned out to have adverse consequences to argue that modafinil use by those without illness should be approached with caution. Others projected into the future envisioning the impact widespread availability of modafinil could have on society to imagine how the drug could be abused, misused and lead to population health problems upstream. The social and ethical considerations raised were framed by dominant medical understandings of the 'healthy body' and the 'healthy mind'.

The scientific and medical experts did not automatically perceive pharmaceuticals as the most desirable technological fix to sleep or cognition problems and these were not privileged above other forms of 'reason'. Instead this form of technology carried forward with it the scars of a long history of failures, unanticipated harms, and social disrepute (Brown, 2005). As such, scientists and clinicians did not expect that new drugs would be miracle cures, golden nuggets or silver bullets. Instead, more modest hopes were proposed: that these drugs, in combination with other non-pharmacological interventions and behavioural changes, might be the best solution currently at hand to help some people in some way.

In the shift workers discourse two alternative modafinil/user configurations were present that scripted legitimate ways the drug could potentially be used by shift workers outside of medical authority. In the first of these, modafinil was configured as a therapeutic substance that could be accessed outside of the medical encounter as a strategy for relieving impairment or suffering in the absence of clinical disorder. In this configuration users were constructed as consumers whom, through a process of self-

monitoring might choose to take the drug to mediate their own sleepiness/alertness. The technological script was, however, still read as a way of restoring a normal level of functioning. This configuration of technology and imagined users was more problematic than understandings of modafinil as a medicine as respondents' frequently conceptualised pharmaceutical use as a 'last resort' and raised concerns over the amount of drugs available OTC. In a second configuration, modafinil was positioned as a safety tool. Legitimate users were (re)configured as responsible and altruistic adults taking the drug for the benefit of others. Within this frame, safety was the most important consideration in the legitimation of drug use.

Three further technology-user configurations were imagined in the student discourse. In these modafinil was configured as: a substitute for caffeine and users were constructed as (ir)responsible consumers; a replacement for sleep with the future user configured as the (anti)social (ab)user; and as a study aid where users were positioned as either competitive individuals or cheats. In each of these configurations, the acceptability of modafinil use was negotiated, contested and debated by students. It was apparent in the data that modafinil could easily fit into existing ways of managing sleep and wakefulness outside of medical control, especially when configured as substitute for caffeine. In this instance, the technology was easily assimilated into existing socio-technical networks and an existing user group readily imagined. However, the means to achieving enhanced wakefulness was important to respondents and there was a strong tendency to associate drug taking with illness, addiction and health risks in their accounts.

A critical analysis of shift workers' and students' perceptions of modafinil revealed how the role of new technology is negotiated within the social context of its use, being understood in relation to individualised routines and private rituals that are intricately related to existing technologies and cultural practices, values and norms. Modafinil then, fits into these existing practices in various ways depending upon cultural conceptions of normality, values of individuality and the pursuit of health, wealth and

happiness in the modern world. A contextualised understanding of such phenomena goes some way to explaining why particular social and ethical issues surrounding pharmaceutical augmentation of cognition were deemed relevant to these communities in the conduct of their everyday lives.

In summary, each configuration of technology and imagined user framed the technology and constructed the prospective users in a slightly different way and came along with its own normative framework. Therefore, although technologies are not neutral and are designed, produced and marketed for a specific purpose with specific users in mind, alternative scripts for use can be imagined and realised as the technology travels between different domains of social life. The legitimacy of use is linked to the specific social norms operating within and between social groups and alternative uses may be considered controversial or inappropriate to those outside of the social sphere. Importantly, this demonstrates that although norms may overlap to some degree, there is no universal set of norms defining and delimiting how modafinil *should* be used in contemporary society.

Although different technology/user configurations may be readily imagined, the next section will reflect upon the process of transformation that a technology must undergo to move from medicinal drug to enhancement tool.

From therapy to enhancement?

At present modafinil is a medical technology under medical authority and control in the UK. Medical norms play a role in setting social norms through the labelling of the abnormal, the therapeutic and ill health (Parsons, 1959). Medical technologies come with scripts for how and why they should be used: to relieve pain and suffering, to attempt to restore normality with the goal of achieving health or preventing illness. Although some medical procedures or interventions may be thought of as more enhancing than therapeutic (e.g. some cosmetic surgery procedures) there is always

some problem, deficit or difficulty they are aiming to mend. To extend, improve and advance the individual body or brain beyond this normal, healthy level without a physical, psychological or social problem to 'fix' is often considered to be beyond the goal of therapeutic enterprise and thus becomes socially, ethically and morally questionable. Whilst some technological interventions presently available are clearly enhancing with little therapeutic benefit (e.g. teeth whitening, botox- although there is a defined 'problem' here in both cases that the intervention fixes to do with social stigma and appearance) the acceptability of an enhancement is intricately related to medical social control for it is the medical community that defines who is a legitimate patient and in need of treatment. Both therapy and enhancement are defined in relation to health: therapy as restoring health and enhancement as making one better than well.

The transformation from medical technology to consumer product is by no means straightforward or easily accomplished. The technology must travel from the medical domain, relinquishing its cultural script as a measured, controlled, specific and potent therapy, to enter other social worlds. In this process the technological script for how the technology should be used may remain intact (for modafinil is still a pill that must be taken orally), but new cultural meaning must be accrued or along the way, in a sense 're-scripting' the technologies purpose of use . The innovators of the technology must find a niche and the users a problem which it is able to fix, or a deficit it can restore in these other domains of social life. To become an 'enhancement' a technology that will make one better than well, something which will boost, better, extend and improve body, mind or performance above the norm, the task becomes even more complex. For if nothing is wrong why does one need to become better? Here individual social goals, aspirations, dreams and desires come to the fore. The technology must become a way to liberate, release (Schwartz- Cowen, 1985) and enable the individual to recreate and transform themselves in their own image for their own personal goals (Rose, 1999), whilst at the same time not posing a risk to health, safety and wellbeing.

Although by definition enhancement is not therapy, medical experts (and those with related professional expertise who operate on the periphery of the medicine) still have cultural authority and power over definitions of health, how to achieve, attain, damage or pose a risk to health. So, for something to be culturally acceptable as an 'enhancement' (be this a food substance, drug, over the counter pharmaceutical product or herbal remedy), it is assumed to have been certified as safe for consumption by this expert community or at least for the risks to health to have been established and outlined before it is made available as a consumer product, therefore enabling the individual to make an 'informed choice'. Drugs which are not safe or pose a greater risk than benefit to health are not certified as safe for consumption, even in moderation, and are classified as illegal. People still choose to take illegal drugs for their own pleasure and for recreational purposes, and do not always follow expert recommendations about how and in which quantity other drugs and foodstuffs should be consumed. However, the data shows that when they do so it is perceived to be at their own risk and this is typically viewed as abuse, irresponsible behaviour or potentially damaging to health.

The extent to which a drug is able to move from therapy to enhancement and leave behind cultural images of addiction, disease, side-effects, health and social problems is debatable. Such a transformation has taken place with other technologies. For instance, as discussed in Chapter 2, the vibrator has successfully been transformed from clinical treatment for the (then) medical disorder hysteria to a device used to enhance sexual pleasure in the private lives of ordinary citizens (Maines, 2001). A more contemporary case is that of contraceptive pills which, once only available on discretion of a doctor, are now on their way to becoming OTC products; available to all. Nonetheless, of paramount concern is safety. Contraceptives, vibrators and coffee have all been around for many years, since before the birth of many of those

interviewed, and are consumed regularly by millions without any significant concern for adverse health effects[37].

Modafinil was identified as different from these other technologies by respondents because it is a relatively new substance yet to enter popular usage. It is delivered in pill form which sets it apart from most foodstuffs (with the notable exception of caffeine pills) and mechanical technologies (e.g. alarm clocks) used to control sleep and boost cognition. Instead, it was likened to other medicines, pills, drugs and tablets that are available in various forms in British society and was positioned in line with these cultural scripts. How the substance is regulated, controlled and presented to the potential user (as either medicine or consumer product) and what this implies in relation to health benefits and the safety of consumption were important considerations in whether the chemical augmentation of cognition was considered to be legitimate or not.

The role of medical authority in defining legitimate spaces for drug use will be discussed in the next section before moving on to consider the potential impacts of this type of technology on notions of self-governance and identity and the wider social and ethical issues that this raises.

Medicalisation of sleep and cognition

Whereas in neuroethical discourse it was the impact modafinil could have on the brain (and notions of the self) that dominated ethical discussion, the discourse of prospective users was more focused on the potential impact of the technology on sleep. Tension was observed throughout the data between two different, yet overlapping, understandings of sleep: sleep as a period of rest and relaxation that is natural and vital to health and wellbeing; and sleep as an inconvenient waste of time

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[37] Despite caffeine being linked to a range of health problems in the scientific and medical literatures, this was rarely acknowledged by its users. The possible health risks associated with contraceptive pills are more frequently acknowledged.

that can be dispensed with. Although in general terms, sleep was considered important, all respondents admitted cutting back on sleep for education, employment and recreational purposes.

To some extent this study confirms the findings of other research in the sociology of sleep, 'that sleep is indeed another chapter in the medicalisation story' (Williams et al, 2008b). This is especially evident with the emergence of the relatively new condition: shift work sleep disorder. However, such medicalisation is controversial within the expert community as the data shows that SWSD was flexibly interpreted as a disease definition. Critics of modafinil and SWSD voiced concerns of potential 'disease mongering' (Woloshin & Schwartz, 2006), that a new disorder has been created, in part by the manufacturers of the drug, in order to expand the market for their product and increase sales.

The shifting engines of medicalisation

Current debates within medical sociology point to the 'shifting engines' of medicalisation (Conrad, 2007) and discuss how new drivers of the process include: the patient-consumer in search of diagnosis or a technological fix for a variety of self-diagnosed problems (Tomnes, 2006; Furedi, 2006), the pharmaceutical industry aiming to expand their markets in order to sell more drugs and make more money (Moynihan et al, 2002); cultural influences such as the Internet and media which often cast problems and their solutions in the rhetoric of medicine (Kroll-Smith, 2003), contributing to the process on a conceptual level by encouraging problems to be thought about in medical terms.

When taking an STS approach to focus on the interaction between technology and prospective users it becomes apparent that not only are the drivers and engines of medicalisation changing, the medical profession is also changing the discourses and frames it uses to promote understandings of health (in relation to sleep at least). The

analysis confirms claims in medical sociology that there is a changing discourse within medicine to focus on choice as patients are encouraged to become experts on their own illnesses (Rose, 2007). Most significantly, the data illustrates how a balance is being struck between biological or genetic determinism and social determinism, with individual differences and pathologies being explained through bio-psycho-social worldviews which take into account the biological, genetic, chemical and physical make-up of an individual, their psychological states and socio-cultural environments. This is reflected in the solutions posited for contemporary problems such as SWSD which include not only pharmacological therapies, but behavioural strategies, based upon negotiations between expert advice offered by medical/ psychological experts and expert knowledge of the patient/consumer's own social environment, demand and desires.

This indicates that instead of the medical imperialism exposed in the 1970s where scientific and medical professionals were accused of indiscriminately and illegitimately extending medical dominance (Zola, 1972; Friedson, 1970; Illich, 1975), such actors can, to some extent, be thought of as 'putting the brakes on' medicalisation (Conrad, 2007). This, of course, could still serve professional interests, speculatively, by keeping a defined and secure medical sphere within which medical professionals can keep hold of their knowledge, power and expertise. For if the medical sphere becomes too large and all-encompassing it may also become too diffuse, difficult to control and thus open to more challenges from other forms of knowledge. On the other hand, one could see the increasing involvement of the patient/ consumer in medical care and era of patient choice as akin to the exertion of medical dominance, albeit in a new liberal, patient friendly way.

As Rose (1994) suggests, a paradoxical situation ensues: individuals have control over their own bodies and choose how they live their lives, choosing when to engage with medicine and which interventions are most appropriate to them in the context of their everyday lives. But at the same time, scientific medicine defines states of

normality, health and wellbeing, issuing guidelines, advice and recommendations how to live one's life. Therefore, the non-patients, those 'at risk' of future illness are held responsible for maintaining their own health, but to do this they must have access to and follow expert advice (e.g. eating the correct diet, do the recommended amount of exercise, get enough sleep, give up smoking, limit their alcohol intake). Those that do not follow this protocol are held (at least partially) culpable for any resulting health problems that could have been avoided if they had been a responsible citizen and cared for themselves appropriately (i.e. contemporary debates in the UK about whether people with alcohol or smoking-induced illnesses should be treated on the NHS). Individuals are free to choose how they live their lives as long as they choose the path set out by scientific medicine, or else they are penalised by being denied access to some services or held morally culpable for their health problems. Therefore, although individualised routines and rituals are important in understanding how new medical technologies are accepted or resisted, the extent to which these escape the dominant and normalising discourses of society is questionable (Seale et al, 2007).

Medicine and culture

According to Williams and Conrad, analysts ought to use 'medicalisation' as a descriptive term to explain how a particular phenomenon comes to be thought about, recognised and treated as a medical problem (Williams et al, 2009, Conrad, 2007), not in attempts to explain why this may have occurred. However, one cannot ignore the normative and cultural values allied to medical authority and expertise. In all strands of the data collected it was evident that the medicalisation of sleep was accompanied by powerful images of illness, healing and (ab)normality which acted to make drug use appear socially acceptable. The normative connotations of medicalisation were that those bodies designated as ill, defective or not performing to the medical standard of normalcy should yield to medical authority, advice and technology in order to regain a level of normality. The technology in question in this study can clearly be used in a non-medical setting for non-therapeutic purposes, as demonstrated in the media data

through the case of sport and controversy surrounding athletes taking the drug. However, without illness or impairment it appeared more difficult to justify the use of neurotechnologies to alter cognitive processes.

Interestingly, in the work and student contexts, engagement with a medical rhetoric was mixed, but so was normative reaction to drug use. Some contemporary scholars argue that the social role of medicine is changing from an institution that cares for and heals the sick to a tool for self-improvement in a society where one can (re)create themselves and their bodies in the fashion they choose (Clarke et al, 2003; Negrin, 2002; Rose, 1994; Gray, 2002). Despite the fact that modafinil is a drug that has been researched, developed, designed and marketed as a medicine, use of the drug outside of a medical context was often imagined and has been realised (e.g. controversy about sportspersons taking the drug; journalists exploring the idea of a sleepless society; stories of ambitious business (wo)men forsaking sleep in order to get ahead in the workplace). Arguments were present, in the media data in particular, as to why this type of technology could be beneficial outside of the medical domain as a consumer product to reduce the need for sleep and boost cognitive performance.

However, within scientific and medical discourse, based upon institutional norms and strong traditions of drug development with the goal of healing, it was difficult for these stakeholders to read the technological script attached to a drug in any other way than it being a medicine. Similarly, in the data of prospective users, drugs, tablets and pills were still understood within a wider medical framework related to notions of 'normality' rather than 'improvement' and positioned as technologies to be used for the goal of restoring health or preventing illness- not as enhancements. The data shows how technological scripts operate within specific socio-technical niches (Borup et al., 2006) and are, to some extent at least, constrained by the norms operating within that domain of use.

Implications for modafinil use and users

Members of both prospective user groups who were interviewed questioned the appeal of extending wakefulness and the need for cognitive enhancement in their daily lives. Imagined users and uses of the drug were embedded within elaborate visions of future worlds. Such visions functioned as a device for prospective users to explore hopes, promises, concerns and fears surrounding the availability of enhancement drugs. Through the figure of the 'future user' (Wilkie & Michael, 2009) visions of dystopian futures were constructed which acted to justify respondent's attitudes in the present. Overall, medical monitoring and control of the drug was thought of as the best way to ensure benefits were afforded to those that really needed them whilst preventing abuse, dependency and dangers to health. Interestingly, when respondents were asked what impacts this type of technology could have on society, it was the wake-promoting effects of modafinil that fuelled visions of the future. The potential cognitive enhancing effects of the drug were rarely mentioned.

Although there was a general acceptance of the competence of medical professionals to decide who should and should not have access to modafinil, many of those interviewed thought that taking a pill for this type of problem should be a 'last resort' to be used in times of crises or if the individual was experiencing severe problems or distress rather than a first line intervention. Notions of self-governance and individual responsibility for varying states of somnolence were prevalent in interview accounts. Individuals demonstrated a wealth of lay knowledge and expertise governing their own sleepy bodies and cognitive functioning through a variety of technologies including the regular consumption of OTC pharmaceutical products and food-stuffs to negotiate sleep, work and health in their everyday lives.

Wolpe argues that 'clearly, some of the top selling drugs in the world today are being used by patients who fit no traditional definition of pathology, yet still see in their own functioning a deficit that these drugs address' (202: 382). In the most part, the data

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appears congruent with this position. Those experiencing some sort of deficit saw pharmaceutical treatment as one part of the solution for them, whether accessed independently or through a medical consultation.

Additionally, respondents thought that if a substance was freely available to them it must have been certified as safe for their consumption. On the other hand, if a substance was mandated via prescription respondents believed this also to be for good reason. Modafinil was introduced to respondents as a prescription drug and despite the different uses and users that were imagined, most respondents returned to this configuration in their assessment how the drug *should* be used. In this sense, the data fits with other research that suggests that there are times when the consumerist role is rejected with preference towards a more traditional role of recipient of expert knowledge (Lupton, 2003). 'Passive' patients go to the doctor for information and expert advice, with both groups appreciating the asymmetry in knowledge and do not identify (or perhaps even resist) themselves as consumers in this context.

Similarly, most respondents said they would take modafinil if it was prescribed to them by a medical professional, but would not attempt to buy or take the drug if it remained a prescription medication and would judge others for doing so. Drawing heavily on medical rhetoric, use of modafinil by those without problems or impairments was regularly constructed as abuse of prescription medication. In addition, understandings of modafinil use as an 'enhancement' technology were problematised by several individuals who thought that using the drug would imply they had a problem, inadequacy or inability to cope. However, it was also apparent in the data that the same individual can act as both consumer of health care and passive patient depending on context (Stevenson et al, 2008). This point is discussed further in the following section.

Pharmaceuticalisation, subjectivity and technologies of the self

Although Nik Rose's work can be criticised for its lack of empirical grounding, echoes of the 'new regime of the active, autonomous, choosing self' (1994:168) he proposes were found in the data, most notably in the student discourse. Rose argues that the lives of citizens are governed through the choices they themselves make, where individuals are free to the extent they choose a life of responsible selfhood guided by cultural norms and expert advice. New biomedical techniques of intervention open up new possibilities for action on the self, creating new choices, identities and possibilities. These technologies 'translate the goals of political, social, and economic authorities into the choices and commitments of individuals' (1994; 165). In its configurations as a study-aid, a replacement for sleep and a substitute for caffeine, modafinil use was positioned outside of the medical domain. In these instances, the use of the substance was constructed as a technological optimisation, a way to alter or adjust oneself in order to enhance performance, productivity or pleasure.

When use of the technology was considered in the context of other wake-promoting or cognition boosting technologies (i.e. caffeine) by potential end users use of the substance it became less ethically contentious. However, the pharmaceuticalisation of sleep (Williams et al, 2008a) was not accepted uncritically. Scientists and clinicians maintained their position that modafinil is a medicinal drug, not a foodstuff or replacement for caffeine, again on the grounds of safety. For potential end-users, if modafinil was to become available for them to purchase on the supermarket shelves like caffeine pills and energy drinks are today, they assumed the substance would be safe for consumption. Therefore purchase of the technology would be an act of consumerism and augmentation of cognition or sleep considered to be a lifestyle choice.

Therefore, whereas medicalisation of sleepiness generally acted to legitimate the application of a pharmaceutical solution for sleep/alertness problems on the grounds

of regaining normality, pharmaceuticalisation to extend capacities or functioning without medical control and expert guidance was more problematic. Although such configurations were regularly imagined, as discussed in the above section, modafinil could not easily escape its association with medicine and previous cultural script as a medicinal drug. The majority of the respondents said that presently, they would not choose to take a cognition-enhancing drug to serve such purposes. Without an obvious deficit to restore respondents questioned why they would need to take the drug in the first instance.

Despite this, the temptation built into enhancement technologies was alluded to by many respondents. The expectation that improved cognition will lead to better, more productive, efficient and successful citizens is deeply entrenched in the neuroethics literature. Using the term 'enhancement' to describe the action of new neurotechnologies actually does a lot of normative work in and of itself. For some the word enhancement is interpreted to literally mean 'better' and the difficulty of arguing against something that will make one better was acknowledged in the data. Overall, opposition to cognitive enhancement as a concept was fairly weak. Positive impacts of this technology were imagined in terms of health, wealth and productivity, provided the technology was safe, legal, and available at relatively little cost. In fact, two thirds of students interviewed said they would be more tempted to take modafinil for its prospective performance enhancing effects than as a replacement for sleep.

Despite this, individuals rarely thought of modafinil use in terms of 'improvement' or an 'enhancement' that would make them 'better than well' or transform them in some way beyond current levels of possibility. Instead, non-medical use of the drug was positioned within a culturally available narrative currently occupied by caffeinated products, energy drinks, various vitamin and herbal wares and foodstuffs: a way for one to attempt to increase alertness if finding it otherwise difficult at socially desirable times. How pharmaceutical products are perceived by consumers may be dependent on the product in question and the context in which its use is sought (Stevenson et al,

2008). This was evident in the data with many respondents displaying uncertainty about modafinil because they were unfamiliar with the substance, yet being comfortable with the chemical augmentation of sleep and cognition through other more established pharmaceutical technologies.

There was however, one instance in which members of all three stakeholder groups thought that the extra-medical pharmaceuticalisation of cognition would be socially desirable and appropriate. This was the case of acute use in emergency situations (e.g. natural disaster) where modafinil could potentially be used to enhance the cognition of users without clinical disorder. When the technology was placed into this context it ceased to become medicine and was instead understood as a type of safety apparatus. Here, potential users thought that the dangers posed by the drug would be outweighed by other threats to health and life. Often, no illness was deemed necessary for drug consumption and in some instances OTC availability of such a substance thought appropriate. This formation of technology and user was quite different from the 'medicine as enhancement' configuration discussed by Clarke et al (2003), as use of the drug was justified on the grounds of public safety with the goal of helping others, rather than individual health promotion and improvement of bodies for purposes of self-fulfilment.

Although safety is often dismissed as a practical issue that requires little consideration in the neuroethics discourse, it appears that outside of medical uses for the drug issues of safety are paramount, forming both obstacle and endorsement to the technological manipulation of sleepiness/alertness. For instance, when health and safety were considered to be under threat drug use was endorsed, whereas if the consequences of use were thought to pose a greater threat to the health or safety of the user, use of the drug was condemned. The extent to which the formation of modafinil as safety tool goes beyond medicine is also open to debate, as the scientists and clinicians interviewed conceptualised the drug as a way of preventing harm or illness, still prescribed by medical professionals to those in need. All 'enhancement'

uses of the drug by those who were not suffering or under threat of harm were denied as viable applications of the substance by medico-scientific professionals. Instead, the social role of medicine was depicted as encompassing the treatment of illness or disorder, the prevention of ill health and the protection from harm to health.

The analysis presented here shows that when thinking about the framing of pharmaceuticals in terms of therapy and enhancement it is actually very difficult to go 'beyond medicalisation' as Williams et al (2008a) propose. Issues of 'pharmaceuticalisation' undoubtedly overlap with and are bound up in processes of medicalisation and their normative connotations. This is especially the case when the technology in question has been developed, is marketed, regulated and used as a medicine. Whilst medicalisation acted to legitimise use of the drug under specific circumstances, there was evidence of resistance towards pharmaceuticalisation of cognition for those without problems or impairments. At present it appears difficult to justify using medical technology for the goal of 'enhancement' or improvement without the moral imperative of restoring, maintaining or protecting health (of self or others). In the case of new medical technologies such as modafinil that are approved for the treatment of specific conditions but can be used as 'enhancements' for other capacities, medicalisation of some degree may in fact be a *requirement* in the legitimation of technological/pharmaceutical intervention whilst medical professionals act as 'gatekeepers' (Conrad, 2007) for their delivery. Conversely, for OTC use to be accepted demedicalisation may be a requirement. The technology must no longer be thought of as a medicine and be reframed or re-scripted in a different way in order to gain a new identity and cultural script for how, when, and whom it should be used by (i.e. as a foodstuff, recreational drug, consumer product).

Re-thinking the therapy-enhancement debate

This thesis has taken an empirical approach to explore the complex social contexts in which modafinil could be used as therapy, enhancement (or otherwise) from the

perspective of the media, scientists and clinicians, shift workers and students. It has found that the way we live our modern lives acts to both create and constrain particular understandings of sleep, wakefulness and the body. A contextualised understanding of these phenomena shapes which particular social and ethical issues surrounding pharmaceutical augmentation of cognition are deemed relevant by these communities in the conduct of their everyday lives and how they make normative judgments.

The idea of improving one's cognitive abilities did not elicit as much excitement from or appeal to prospective users as perhaps the neuroethics literature and media coverage suggest. However, the potential effects the drug could have on one's need to sleep did provoke a strong reaction in both potential end-users of the drug and scientists and clinicians who work in close proximity to the substance. Reactions to modafinil as a wake-promoting substance were mixed and ranged from surprise and intrigue to fear and unease. However, the strongest feature across the interview data was that of disbelief and scepticism that the drug as an enhancement technology would work and not be harmful on a biological, psychological or social level.

Throughout the data there was a strong qualitative difference in the social and ethical issues raised in each social context and user/technology configuration that was imagined. There are clearly different forms of 'enhancement' and indeed ways to define what 'enhancement' is. Empirically, the imagined context in which the technology would be used impacted upon how both use and user were framed with context of use and type of user assuming more importance in ethical decision making than the impact of the technology at a biological level (Conrad, 2007).

Of significance in the interview data was how in several of the imagined configurations, the discussion of modafinil use and users appeared to bypass the dichotomies of health and illness, normal and abnormal, and therapy and enhancement that structure the neuroethical, and to some extent, media debates

around human enhancement. The fluidity between such concepts and blurredness of any boundaries between them has long been recognised and is often acknowledged by social scientists and ethicists alike. Some scholars involved in ethical debates argue that to maintain a distinction between therapy and enhancement is helpful, useful or required at the analytical level, whilst others think that it is necessary at a practical level to contain further medicalisation or indeed pharmaceuticalisation of everyday life (The President's Council on Bioethics, 2002; Tannsjo, 2009; Dees, 2004; Daniels, 2000). This study shows that although useful in an analytical sense, it is also extremely limiting to uphold a therapy- enhancement dichotomy as the analyst may be blinded towards other ways in which use of the technology is positioned, negotiated, realised and resisted by potential users in the context of their daily lives.

On this count, the most striking case in the data was that of acute use in emergency situations. In this context, the potential consequences of excessive sleepiness and cognitive impairment were framed in such a way that the normative positions emerging across data did not rely on the concept of normality nor the distinction between therapeutic and enhancing uses of the drug. Instead justification was often sought through appeals to wider non-medical narratives relating to both individual and public safety.

Over the past thirty years, a bioethical enterprise has proliferated and become professionally established as an 'objective' means to arbitrate contentious issues arising from the prospect and development of new knowledge and technologies (Rose, 2007; Armstrong, 2006). However, it is apparent from the data collected in this study that the ethical debate around the uses of new neurotechnologies thus far comes with its own worldview, inscribing the technology in question and imagined or actual users with its own ideology. Many different types of prospective user of cognition enhancing drugs are imagined in ethical debates, from the 'surrounded solider' to the 'drowsy doctor'. Throughout the neuroethics discourse we are presented with an image of society that is skill driven and knowledge-based where one's success

correlates with their cognitive abilities (Rose, 2002; Esposito, 2005, Glannon, 2008). Enhanced cognitive capacities are thought of as a competitive good that can give some people an advantage over others in gaining employment, advancing careers and earning a higher income. The pursuit of cognitive enhancement is assumed to be desirable and in increasing demand and these assumptions play an important role in framing the issues arising in ethical discussions.

Often, the idea of cognitive enhancement is problematised, deconstructed and debated in neuroethical debates whereas its counterpart, therapy, is left unscathed. In the case of modafinil, the data gathered from both scientists and clinicians and putative recipients of the drug indicated that such therapeutic uses of the drug would be less straightforward than imagined in neuroethical debates. Disorder was considered to not only reside in the individual brain and its processes, instead being constructed as resulting from a combination of bio-psycho-social factors and cultural formations. Pharmaceutical technologies then, were often seen as a 'last resort' or one option of many, certainly not as a 'first line intervention' (as suggested by Rose, 2007 p.222) or the only way to properly treat and manage cognitive disorder.

How new technologies fit into the existing sociotechnical networks operating in the everyday lives of potential patients/consumers is paramount to understanding the social and ethical issues that are raised. For the ordinary postman, caller centre operative, the retail assistant or undergraduate student going about their daily business, a drug to boost cognitive performance does not appear to create as much enthusiasm as it does for the analytic philosopher or the busy academic. A technology that allows one to further control sleep and alertness, in addition to caffeine, alarm clocks, pillows, herbal remedies, sleeping pills and CPAP devices can be more easily assimilated onto the daily lives of citizens. However, the technology in question in this study is a pharmaceutical pill that does not easily escape its technological and cultural scripts as a medicine that should be used to treat disease.

Pharmaceuticals are technologies coded with various social and cultural understandings about the social lives, relationships, self image and characteristics of their consumers (Rose, 2007; Lakoff, 2005, Kramer, 1993). The medicalisation and pharmaceuticalisation of daily life alongside the domestication of pharmaceutical consumption therefore affects the ways in which elements of everyday life are understood and problematised. Although the very word 'enhancement' suggests that technological optimisation and shaping of the self is a positive process- allowing the individual to free themselves from the constraints of their biology and transform their identity, there is still a form of biomedical governance at work shaping desires for how bodies, brains and identities should be transformed (Clarke et al, 2003; Wehling, 2005).

In summary, situating cognitive enhancement in social context allowed some key assumptions found in neuroethical debates to be questioned. Firstly, that there is this widespread desire to use cognitive enhancing drugs to enhance performance beyond a normal level (as predominantly, drug use was thought of in terms of treatment or protection, not enhancement). It was also evident that in the neuroethics literature cognitive enhancement is too easily equated with beneficence at the individual level. Through the configuration of modafinil as a safety tool that could be used acutely by some shift workers in particular, this notion was questioned with drug use seen as a move towards safety and providing better care for others whilst potentially putting individual health at risk. It also emerged just to what extent therapy and enhancement are qualitatively different as respondents did not perceive a need for enhancement in the same way those with problems have a need for treatment.

Therefore, the findings of this study strongly suggest that understanding and debating the use of new neurotechnologies within a therapy-enhancement dichotomy is insufficient and inadequate. Instead, one has to take into account the multiple ways in which drug use and users may be configured across different domains of social life.

Limitations of the research

Cognition enhancing technologies can be thought of as 'emerging technologies' that are yet to be widely introduced in the UK, and although modafinil is available as a prescription drug, it is not well known outside of the scientific and medical domains. Researching how modafinil was thought about and its use positioned and negotiated in social context therefore posed a particular methodological problem for the study. This was addressed through a focus on the way in which uses and users of the drug were imagined (as opposed to assessing the way in which the substance was actually used) by those interviewed (Borup et al, 2006; Brown & Michael, 2005; Wilkie & Michael, 2009; Weiner, M.S). Of particular importance were the ways in which roles for the technology were embedded (both explicitly and implicitly) in projections of future users (which could be the interviewees themselves or imagined others) and their likely characteristics, attributes and motivations (Woolgar, 1991; Akrich, 1992; Lindsay, 2005).

In order to engage prospective stakeholders in conversation about a technology that they had not heard of before, it was necessary to provide them with some information about that technology and the contexts in which it could be put to use. Although measures were taken to provide a balanced and accurate summary of information about the technology that is currently available in the public domain, it is also important to recognise that interviews are social encounters (Dingwall, 1997). Therefore, the opinions expressed during an interview may, in a sense, reflect the questions that were asked by the interviewer, the information that was given to the respondent and how this was framed. This means that when presented with further information or thinking about modafinil use in different (or real) social and political conditions, the respondent may not necessarily provide the same opinions, attitudes and evaluations of modafinil and its uses. During analysis of interview data it was evident that people can and do hold conflicting sentiments towards modafinil use and users at the same time. This ambivalence towards the drug and its prospective uses

was apparent across all three of the stakeholder groups interviewed. The STS approach, used to analyse the data, drew attention to the contention that the impact, use and interpretation of a technology is neither certain nor fixed and that different interpretations can exist side by side (Stirling, 2008; Singleton & Michael, 1993) and vary over time (Morrison, 2008). The analysis illustrated the ambivalence that exists towards technologies such as modafinil and was particularly useful in highlighting some of the complexities involved in evaluating the perceived legitimacy of uses of the technology within and between different social groups. According to Kearnes and Wynne (2007) public ambivalence about emerging technologies can be used as a 'creative resource'. They suggest that public values could be incorporated into the development and trajectory of new and emerging technologies at an early stage, increasing the role of public participation and engagement in contemporary science policy. Knowledge about imagined futures may therefore be used to shape present policies, perceptions and products or to critically evaluate them.

A fundamental limitation with using case studies in social research is the plausibility of generalising results and extending the findings of the investigation to other similar cases (Hammersley, 1985). The implications of this are that the results obtained through the study of this particular case will not be directly generalisable to other forms of cognition enhancer. However, it has been possible to gain an understanding of how decisions are made about the acceptability of different uses for enhancement technologies and how these are negotiated in social context. This research, alongside previous studies of other cognitive enhancing lifestyle drugs, such as Ritalin (Singh, 2004; 2007) and Prozac (Rose, 2003), have demonstrated the distinctive contribution that social scientists can make to the bioethical analysis of pharmacological advances. Further empirical research is required to assess the extent to which the availability of technologies such as modafinil are contributing to the pharmaceuticalisation of daily life at both the macro and micro levels. However, the findings of this research contribute towards an empirical evidence base for ethical and policy debates on cognitive enhancement. Therefore, the results of this research could be used to inform

future regulatory and policy debate regarding cognitive enhancement technologies in general.

Concluding comments

As neurotechnologies continue to be developed and use proliferates both inside the clinical encounter and beyond, important questions are raised about the extent to which policy should promote or control their use. It has been argued that the deployment of ethical expertise is increasingly becoming the mechanism through which public concerns about new and emerging technologies are adjudicated (Rose, 2007; Armstrong, 2006; Pellegrino, 1999; Salter & Jones, 2004).Through an assessment of how prospective users of modafinil make decisions regarding its legitimacy, it has been possible to gain some awareness of the narratives that are being threatened by dominant neuro(ethical) discourses.

At present, medical professionals are gatekeepers for modafinil, therefore it is ultimately up to this community to decide who has access to the substance, for which (psycho-bio-socially defined) problem it becomes a solution, and the appropriateness of use. This too has political implications for future uses of the drug, as medical and scientific experts will undoubtedly be called upon to provide testimony if the drug was ever to be (re)considered for over the counter use. As the analysis shows, pharmaceuticals such as modafinil could potentially be put to many uses throughout various domains of social life. In which contexts the pharmaceuticalisation of sleep/cognition is culturally legitimate remains open to debate. As with any technological development, technology can flexibly interpreted by users in local contexts and therefore how the technology fits into existing practices and socio-technical networks operating within specific contexts can only be uncovered by speaking to a variety of users (Hoffmaster, 2001). An analysis of how different actors frame the uses of new neurotechnologies and their related social and ethical implications is of importance in understanding the acceptability of such compounds in

different social arenas. Increased understanding of the diverse ways in which prospective users accept or reject new technology may contribute towards more accurate assessments of the social implications of the proliferation of cognition enhancing drugs and help in the development of sound policies (Hoffmaster, 2001).

From this study, at present it appears that although many different types of use and user of modafinil can be readily imagined, acceptability of use is normatively constrained through medical discourse as modafinil does not easily escape its cultural script as a medicinal product, ultimately bound to health, expert knowledge and medical authority. As discussed by Borup et al, (2006) expectations of the future user are literally and materially scripted into technologies and socio-technical systems. There is still a strong cultural tendency to associate drug taking with illness, addiction, dependency and risks to health which may provide a barrier to widespread psychopharmaceutical use outside of medical authority.

At present, demand for and desirability of cognition enhancing drugs may be far less abundant than imagined in ethical debates. How this could change in the future, as new knowledge, technologies and techniques for explaining, intervening and manipulating bodies and brains are developed and deployed, both within and beyond the medical encounter, is open to debate. Perhaps in the future, cognition enhancing drugs will come to be accepted as part and parcel of everyday life and new uses and user groups may emerge. Only with passage of time will we truly be able to tell if the chemical enhancement of normal bodies and brains flourishes in society and if indeed consumers come to see these drugs as 'magic bullets' to resolve their everyday problems.

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Appendix I: List of neuroethics papers

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Appendix II: Contact letters

<u>**Scientists and clinicians**</u>

Each email sent out to scientists and clinicians was personalised to reflect the interest of the individual in question and altered accordingly depending upon whether they were contacted directly at their place of work or through their attendance at WorldSleep 07. A generic form of the letter is included below:

Dear XXXX

I am a postgraduate research student based at the Institute for Science and Society at the University of Nottingham. For my doctoral research (funded by the Wellcome Trust) I am investigating the relationship between sleep and health from a sociological perspective, and the role of medicine in mediating this relationship. For further details of the project see attached summary.

I am currently interviewing clinicians, physicians, and academics with an active interest in sleep and was hoping that you would be interested in taking part in this research. If so, the interview will be informal and last about one hour. We can either arrange to meet up or I can conduct the interview over the telephone if you would prefer. All responses will be anonymised and treated as confidential. If you would like to take part or require any further information about my research please do not hesitate to get in touch. In addition, if you think any of your colleagues at XXXX might be interested in taking part please feel free to pass on my contact details.

Thank-you for your time and I hope to hear from you soon.

Yours sincerely,

Catherine Coveney

Shift workers

Shift workers were recruited for the study via a social networking website. The information provided to participants on this website was as follows:

Hi,

 I am conducting a study at the University of Nottingham funded by the UK medical charity the Wellcome Trust about attitudes towards sleep, work and health in the UK. I am interested in talking to people of any age and in any occupation that do shift work. So, if you or any of your friends or family work hours outside of the traditional 9am-5pm working day and would to take part in the study I'd love to hear from you.

Your participation in the research will involve a short and informal interview with me lasting approximately one hour. I would like to talk to you about your experiences of shift work and attitudes towards sleep and health in general. We can either arrange to meet up or I can conduct the interview over the telephone if you would prefer. Everything you say will be treated as confidential and your identity will be anonymised.

If you have any questions or would like any more information about the study please get in touch. I look forward to hearing from you and thanks again,
Katie

Students

Students were contacted via the University of Nottingham's internal email system. The following email was sent out to prospective interviewees and followed up with a second email to set a date and time for the interview.

Title of email: Invitation to participate in research study

I am a postgraduate research student based at the Institute for Science and Society at the University of Nottingham. I am writing to enlist your help in a research project investigating attitudes toward sleep, work and health in a 24/7 society. I am interested in talking to current students about student life in 2008. I was hoping that you would be interested in taking part in this research. I appreciate that everybody's time is in short supply, but by taking part in this study, you will be playing an important role in this research.

All that your participation will require is taking part in an informal interview lasting approximately one hour about your experiences as a student and attitudes towards sleep and health in general. All responses will be anonymised and treated as strictly confidential. You will receive a £5 gift voucher as compensation for your time.

If you are interested in taking part or would like some more information about the study then please get in touch. I will be conducting interviews on weekdays between 10am and 4pm in the Law & Social Sciences Building, University Park from Monday 24th November to Friday 12th December 2008. Please indicate your preferred date and time.

Thank- you for your time and I hope to hear from you soon,

Catherine Coveney

Appendix III: Table of interviewees

Name*	Organisation	Specialism
1. Scientists and Clinicians		
1. Adrian	UK University	Sleep scientist, neuroscience of sleep
2. Bernard	USA research institute	Sleep scientist, psychiatry and psychology
3. Charlie	USA university	Clinician, psychiatry and BSM
4. Dan	USA sleep clinic/ USA university	Clinician, sleep biology and sleep medicine
5. Edward	USA university/ USA sleep clinic	Clinician, clinical psychology and sleep medicine
6. Fay	USA university	Sleep scientist, sleep deprivation
7. Jane	UK university	Sleep scientist, circadian biology
8. Harry	UK research institute	Clinician, behavioural sleep medicine
9. Isobel	UK research institute	Sleep scientist, CBT for sleep disorders
10. Gemma	UK research institute/ EU university	Sleep scientist, sleep disorders
11. Karen	UK research institute	Sleep scientist, sleep disorders
12. Lin	UK research institute	Clinician, clinical psychology
13. Mas	UK private sleep clinic	Clinician, sleep medicine, neuropsychiatry
14. Gita	UK private sleep clinic	Clinician, psychotherapy for sleep management
15. Orla	UK private sleep clinic	Sleep scientist, clinical psychology

2. Shift workers		
1. Kim	Nurse	
2. Hannah	Support worker	Mental health support worker and part-time retail assistant
3. Toby	Airport worker	
4. Hamish	Medical doctor	Hospital based medical doctor
5. David	Medical doctor	Hospital based medical doctor
6. Mo	Postal worker	
7. Karolina	Nurse	
8. Paul	Factory worker	
9. Alan	Retail staff	
10. Edie	Call centre operative	
11. Matt	Police officer	
3. Students		
S1. Mike	University of Nottingham	Undergraduate student
S2. Kerry	University of Nottingham	Undergraduate student
S3. Dave	University of Nottingham	Undergraduate student
S4. Emma	University of Nottingham	Undergraduate student
S5. Joseph	University of Nottingham	Undergraduate student
S6. Louise	University of Nottingham	Undergraduate student
S7. Daniel	University of Nottingham	Undergraduate student
S8. Bella	University of Nottingham	Undergraduate student
S9. James	University of Nottingham	Undergraduate student
S10. Lizzy	University of Nottingham	Undergraduate student
S11. Stephen	University of Nottingham	Undergraduate student
S12. Chris	University of Nottingham	Undergraduate student
S13. Nick	University of Nottingham	Undergraduate student
S14. Susie	University of Nottingham	Undergraduate student

*Names have been changed to protect respondents' anonymity

Appendix IV: Interview Guides

All of the interviews began with the provision of information about the study and respondents were asked to verbally confirm that they had consented to participate. The following passage was read:

The interview will be divided into four main sections, firstly I would like to ask you a bit about you, followed by some general questions about sleep and health, moving on to talk about treatments for sleep problems and ending with some questions about the future.

Before we start the interview I'd like to inform you that this interview forms part of my PhD research and sections of it may be reproduced in my thesis or any subsequent papers derived from my thesis. With your permission, I will be using a digital voice recorder to record the interview and this recording will be stored by the University of Nottingham for up to 7 years before being destroyed in accordance with current research guidelines. However, I will be the only person allowed access to it and everything you say during the interview will be kept confidential and your responses will be anonymised as far as possible. You have the right to withdraw from the study at any time, in which case the interview data will be destroyed. I will send you a full transcript of the interview once it has been transcribed and you are free to retract any part of it prior to the data being used. After all of that, would you still like to go ahead?

SECTION 1: ABOUT YOU

Scientists

Can you tell me a bit about your own research area?

Have you always worked on sleep, how did you get interested in this topic?

What are you currently working on?

Clinicians

To start with can you tell me a bit about XXXX and your role here?

What kind of patients do you see?

Are these people usually self-presenting or referred via their GP?

Shift workers

Can you tell me a bit about your job?

Do you always work the same shifts or rotate?

How long have you been working shifts for?

Do you have a choice in the shifts you work?

On a typical day what time do you have to get up to be at work? What time do you arrive home?

Do you enjoy shift work?

What are the benefits of working outside of the traditional 9-5 working day?

Students

Which course you are on? How many hours do you work on an average week?

Do you have a part-time job as well as studying? If so, what hours do you work?

What do you do in your leisure time, when you are not studying or working?

How often do you go out in the evenings? How many late nights would you have in an average week?

Do you ever stay up late or get up early to do university work, for example revising for exams or if you have a deadline?

Do you enjoy student life? What is good about it? Is there anything you would change?

SECTION 2: SLEEP, COGNITION AND HEALTH

Scientists/ Clinicians

What is sleep?

What are the known functions of sleep?

What is considered to be a normal sleep/wake cycle?

- How much sleep should we be getting?

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- Is it normal to wake during the night or feel sleepy during the daytime?

What factors can influence an individual's sleep/wake cycle?

And how important is sleep to an individual's health and wellbeing?

Shift workers and students

How does shift work/ being at university impact upon your normal sleep patterns?

What kind of things do you do to help you wake up or fall asleep?

Do you find it easy to stay awake and alert at work/ university?

Do you ever fall asleep at work/ university? How do you keep yourself awake?

What would happen if you did fall asleep at work/ university?

How important is getting enough sleep to you?

How much is enough sleep?

How important do you think sleep is to your overall health?

SECTION 3: SLEEP DISORDERS AND TREATMENTS

3a. Responsibility for sleep regulation

Scientists and clinicians

Are sleep related problems are widely recognised by the medical community as medical problems in the UK?

Do you agree with media claims that sleep deprivation is a social problem in the UK?

Are there particular groups at risk of excessive daytime sleepiness or is it something everyone should be aware of?

Can excessive sleepiness or disrupted sleep wake cycles arise solely as a result of one's lifestyle or would there always be some kind of underlying pathology? Are certain individuals more at risk?

Shift workers and students (asked as appropriate)

Has your employer given you any information about how to manage your sleep when working nights/ early morning shifts? Have you ever asked for any information about this kind of thing?

Does your place of work have any policies or procedures that you know of in place to prevent employees developing sleep problems?

Do you think you have any problems with sleep?

Have you or would you ever think of seeking medical advice for sleep problems? Why/why not?

3b. Shift work sleep disorder

Are you familiar with 'shift work sleep disorder?'

And to your knowledge is this disorder widely recognised as a legitimate medical disorder in the UK, as it is in the US?

Do you think this disorder needs wider recognition?

Shift workers and students

Have you heard of shift work sleep disorder?

It is sleep disorder that some shift workers develop as a result of working shifts. The main symptoms are excessive sleepiness whilst working and insomnia when trying to get to sleep after the shift has finished. Are you surprised that this exists as a medical disorder?

3c. Modafinil and wake-promoting drugs in general

Are you familiar with the wake-promoting drug modafinil (Provigil)?

Do you think that if these drugs become widely used in the management of a variety of sleep disorders that there will be a spread of use to other groups?

Do you think that pharmaceuticals should be used in preference to other interventions?

Do you think that wakefulness drugs (such as modafinil) should be under medical supervision or available as consumer products (as caffeine is)?

In the case of excessive sleepiness associated with shift work, do you think doctors should prescribe drugs (i.e modafinil)?

Shift workers and students

Have you ever heard of modafinil? It is a wake-promoting drug that is used to treat sleep disorders like narcolepsy where people fall asleep all the time and it is also licensed to treat shift work sleep disorder. It has been tested since 1991 and can keep healthy people awake for up to 72 hours with little reported side effects.

Do you think that this type of tablet should be sold in supermarkets and available for anyone to take, or be a type of medicine prescribed by the doctor for only those shift workers that needed it the most?

SECTION 4: PERSONAL OPINIONS

In the final section all respondents were asked similar questions about wakefulness drugs and their use in some possible future scenarios.

If there was a tablet that you could take that would allow you to stay awake and be more alert (but still let you fall asleep after work) would you consider taking it?

How about if these drugs or tablets not only kept you awake but made you think clearer, concentrate better, improved your memory and problem solving planning skills and things like that so made you more effective at your work. Do you think you would take them then?

What impact could the widespread availability of drugs like modafinil have on society?

Do you think that wakefulness drugs (i.e modafinil) should be available in employment, education and for recreation- either now or in the future?

Do you think that people should be expected to or encouraged by employers in certain jobs to take drugs at work?

How would you feel if you found out that other people you work/study with were taking drugs to improve their performance at work/university?

What do you think about athletes or sports persons taking these kind of drugs so that they can stay awake and train longer?

If these drugs were widely available do you think people would take them so that they could for instance, go to work all day and then have a night out and then go to work the next day and not feel sleepy?

Who do you think these sorts of wakefulness drugs should be available to?

Closing questions/ statement: all respondents were asked if there was anything else they would like to add and thanked for their participation in the study.

Appendix V: List of media articles

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