University of Nottingham
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Exploring the constructions of transparency, animal sentience and culture of care in animal research

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Thesis submitted to the University of Nottingham
for the degree of MRes Bioethics

School of Biosciences

August 2021

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Abstract

Animal research remains an important part of science with 2.88 million procedures being carried in 2019 in the UK. Although the number of animals used is declining each year, this is still a significant level of animal use at a time when our understanding of animal sentience is ever increasing. This research work explores the construction of important issues such as open science, animal sentience and culture of care and how these are potentially being seen in terms of animal research ethics responsibilities. Through the lens of empirical ethics, this study explores various actors' awareness and construction of animal sentience, transparency in reporting standards, and perceptions of a culture of care. Previous studies have focused on these, though little research has been done to examine how institutions respond to the transparency agenda and then link this to researchers' views of animal sentience and culture of care. This study is being conducted at an important time when the UK government has asked for a public policy review of the current standing on animal usage in research and alongside the introduction of new UK animal welfare legislation which formal recognises animals as sentient.

This study comprises of three empirical research streams focusing on an analysis of institutions compliance with the UK Concordat on Openness in Animal Research. The first of which is the assessment of outwards facing animal research information on university webpages. Secondly, an institutional survey targeting university animal research contact points and finally, a survey of researchers within a research network were completed. A thematic analysis was conducted on these data to draw out key themes prevalent across the responses.

This work has identified that although there is overall compliance with a number of the core elements of the Concordat, for the majority of the institutes examined, there are still a number of gaps and areas of improvement that the research community should address. For example, clarification and potential standardisation of the definition of the concept of sentience, aiding in translatability. The league table generated in order to allow for comparison between research intensive universities could be used to evaluate compliance to the Concordat and even published to encourage a comparative spirit that may foster improvements and drive transparency across the sector. Perspectives provided by the researchers also indicated a desire to see improvements in overall animal care as well as specific aspects such as animal monitoring technologies. Further work should be done to explore more in-depth perspectives of these important ethical concepts as this may support further reflection on ethical responsibilities and improvements in animal use in experimentation.

The recommendations from this study represent small changes in what will continue to be a long path, which should see gradual but sustained advancement and improvement in animal experimentation practice and policies.

Acknowledgements

This piece of work represents two years of hard work in the midst of a global pandemic. It could not have been achieved without the dedication and support I have received from those around me. I would like to especially thank my supervisors, Professor Kate Millar and Dr Michelle Hudson-Shore, for their uncompromising level of support they have given me to get to this point.

To Saskia and my family, for pushing me when I need it, and for providing a refuge away from academia when I needed it too.

Thank you all.

1 Introduction

The use of animals in medical experimentation has been highly debated for centuries (Franco, 2013). The debates have focused on issues such as animal welfare and suffering (Morton and Griffiths, 1985), constructions of the rights of animals (Regan, 1986), as well as the assessment of the value of the scientific knowledge generated by the use of animals as models of human physiology and disease states (Van der Worp et al, 2010). This has led more recently to the development of approaches such as the 3Rs - Replacement, Reduction and Refinement (Russell and Birch, 1959) and alternatives to animal use (Rowan, 2007) which are discussed in detail in section 2.1.2. All sides of the debate have developed arguments and set out foundations for their positions on this issue (Franco, 2013.) A long history of precedent in terms of the nature of the debate has been established and, in some countries, such as the UK, there has also been a long history of public policymaking as well as public and bioethics debate (Nuffield Council on Bioethics, 2005). In recent times, discussion surrounding ethical positions and how these affect policy and practice has increased drastically in the last 40 years particularly in the UK and across Europe (Nuffield Council on Bioethics, 2005). This debate has been further amplified in the last 18 months due to use of animals in research for the development of COVID-19 vaccinations and disease modelling and subsequent news headlines (Challenger, 2021).

In the last few years, a number of prominent international debates have arisen regarding not only how and if we should be using animals in research, but also which aspects of this area of research deserve the most consideration. In particular, the UK has asked for a public policy review of the current standing on animal usage in the country with many pushing for a "phased out" end to live animal research and a push towards alternatives (Horton, 2021). This also comes alongside the presentation of a UK Parliamentary Bill in 2021 (Animal Welfare (Sentience) Bill 2021) which is currently being reviewed in the House of Lords, proposing that animals will be formally recognised as sentient. This Bill proposes the formation of an "Animal Sentience Committee" with functions relating to the effect of government policy on the welfare of animals as sentient beings (Introduction of the Animal Welfare (Sentience) Bill as part of the Government's Action Plan for Animal Welfare, 2021).

Regardless of the outcomes of such recent policy discussions and decisions, it has been clear that in recent times, public discourse around animal research is so extensive that researchers cannot simply ignore it. In a review by the Animals in Science Committee (ASC, 2020), the Committee acknowledged that there are societal concerns about both the harms to the animals and the merits of benefits that accrue from the research. The authors go on to suggest that these concerns can change with time, and it is important for researchers to encourage critical self-appraisal with due regard to these societal concerns. Some mechanism that is seen to encourage regular engagement with a wide range of societal views on such matters is seen to be the harm/benefit analysis (HBA). The report goes on to state that the HBA:

"*Is needed to ensure the consolidation and accountability of the legislation and to address public concerns about animal integrity, human dignity and institutional responsibility*" (p.8).

When considering the nature of the current debate and the drivers for change, it is important to acknowledge underlying claims and arguments. More generally, the debate about research involving animals is often defined by the question of the moral status (or moral importance) of humans, and non-human animals, of which three stances emerge (Nuffield Council on Bioethics, 2005):

- There is something special about humans, and all humans possess some morally vital property that all animals lack (the clear-line view).

- There is a hierarchy of moral importance with humans at the apex, followed by primates and then other mammalian species such as pigs, dogs, rats and mice and other vertebrates such as zebrafish, with invertebrates (for example fruit flies) and single-celled creatures arranged towards the bottom (the moral sliding scale view).

- There is no categorical distinction between human and non-human animals, they are moral equals (the moral equality view).

These stances affect individual and policy discussions, and which aspects of the research process are considered when researchers reflect on their ethical and societal responsibilities. This thesis examines some key aspects of the current bioethics debate on animal use in experimentation, exploring aspects of animal sentience and transparency in research, with relation to their operationalisation through a "culture of care". Previous studies have focused on these aspects (Hawkins and Bertelsen, 2019; Proctor, 2012), though little research has been done to examine how institutions respond to the Transparency agenda. This study will then go further to link this to researchers' views of animal sentience and culture of care to examining the interconnectivity of animal sentience knowledge and responsibilities to transparency and a larger culture of care agenda.

It is hoped that this work will contribute to this established literature on these issues in addition to helping to improve understanding of the role of UK Concordat on Openness and Transparency in Animal Research and how individual researchers construct and consider these aspects. This research also aims to support the scientific community as they consider and respond to changes in approach to transparency in research that also relates to discussion of animal sentience and approaches to culture of care in relation to standards.

Developing ethical animal research practices is vital to maintaining the quality of both the science and the trust and support of the public. Currently there are processes to evaluate the current standards of the research community through legislation and mechanisms such as the Concordat (Directive 2010/63/EU, 2010; Concordat on Openness on Animal Research, 2014). This is done from both the perspective of operationalising external standards and an internal, reflective perspective, with the hope that these processes can highlight good practices, and

common areas of improvement can be identified, with suggestions of how issues can be addressed where appropriate.

This study focuses on examining formal approaches to open up and be more transparent about animal research focusing on the UK Openness on Animal Research agenda. It explores views of openness in relation to animal sentience and culture of care in experimental animal use. These aspects are being examined in relation to current views within the scientific community and this thesis will discuss these themes through the lens of bioethics and relevant scientific literature.

Although members of the scientific community, philosophers and other scholars interested in ethical practice have been discussing the ethical aspects of their research for quite some time, especially post the second World War, the term "bioethics" did not emerge until the early 1970s (Reich, 1978). Although the exact origin of the term is disputed, it was Van Rensselaer Potter who is credited as publishing the first book on bioethics in 1971. His framing of bioethics as a discipline stressed the interdisciplinary nature of the new discipline and provided a starting point for further work, yet in many ways the notion of bioethics we have today has transformed over time (ten Have, 2021).

The need to look at scientific practice through an interdisciplinary bioethics lens is particularly important when considering the ethical challenge of the use of animals in research which, although some suggest it has become a less heated debate over recent years, still remains controversial (discussed further in detail in section 2.1) and raises many important and complex ethical questions. The use of animals in research raises a range of issues from animal welfare status and what is determined to be acceptable levels of suffering, through to wider discussions around the validity and reproducibility of the research, as well as wider ethical issues raised in conducting research itself.

Within the wider discussion of the ethical dimensions raised by the use of animals in research a number of issues are currently receiving greater attention, and as discussed above the issues of Transparency, Sentience, and Culture of Care are the main focus of this work.

1.1 Transparency, sentience, culture of care and ethical issues

1.1.1 Transparency

As is discussed in this study, transparency can hold researchers to account, produce better science and promote better animal welfare standards. As such, it should play a vital part in research.

The acknowledgement of the need for transparency in this area of research is exemplified by the development and publication of the Concordat on Openness on

Animal Research in the UK[1] published by Understanding Animal Research (UAR)[2] in 2014. The initiative to develop the Concordat will be discussed in a later section (Section 2.2) in greater detail, but it is important to note at this stage the importance of this document in terms of how transparency is understood and operationalised in animal research.

Many have claimed that information surrounding animal research being freely accessible to the public can only serve to improve the quality of the ethical discussions surrounding the practice (Yeates and Reed, 2015). A large portion of this study focuses on mapping and assessing the accessibility, quantity and quality of the information published by animal research institutions in order to meet this goal. It is not just in terms of published information however that transparency is becoming considered a vital part of the research process. Increasingly, scientists are being asked to be more open about their research right from the initial planning stage. This shift to being more open earlier in the experimental process has led to increasing uptake and use of reporting and planning guidelines. Advice such as the ARRIVE guidelines (https://arriveguidelines.org/) (Kilkenny et al, 2010; Percie et al, 2020) and PREPARE guidelines (https://norecopa.no/prepare) (Smith et al, 2018) act as part of ongoing efforts to promote alternatives to animal experimentation and improve the quality of research by enabling other researchers to better scrutinise, evaluate and reproduce it- discussed more in section 2.3.

Furthermore, in the UK, institutions such as the National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs)[3]; and the Fund for the Replacement of Animals in Medical Experimentation (FRAME)[4] continue to bolster efforts to provide accessible information to the public as well as improve the quality of research even at the early stages of experimental design. Different approaches of public engagement are proposed and used to open up animal research debates but there are increasing efforts to link these processes directly to the animal experimental work. The interlinking of public engagement and experimental design is best exemplified through the terminology of Patient and Public Involvement and Engagement (PPIE). The term is used to encompass the range of different ways in which patients and publics are now being involved in and are engaging with research that involves animals. It is increasingly used in literature to account for the blurred boundaries between the identities of patients and publics, and the practices of involvement and engagement (Gorman and Davies, 2019). These approaches offer the potential for new ways to open up this scientific process to ethical debate on transparency, important bioethics questions of the ethical status of animal and what this may mean for animal research in the future. These aspects will be discussed further (in Section 2.3) in relation to

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[1] Concordat on Openness on Animal Research in the UK[1] (https://concordatopenness.org.uk/)

[2] Understanding Animal Research (UAR; https://www.understandinganimalresearch.org.uk/)

[3] National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs; https://www.nc3rs.org.uk/)

[44] Fund for the Replacement of Animals in Medical Experimentation (FRAME; https://frame.org.uk/)

research conducted of the topic of transparency and its relation to experimental design.

1.1.2 Sentience

When discussing ethical responsibilities to animals, a key aspect of the debate historically has focused on the mind of animals and their ability to sense and to suffer. One of the key mysteries of the biological sciences is the human ability to be aware of its own existence. Though difficult to demonstrate at an objective, scientific level, it is widely assumed in society that all humans are individuals, capable of independent thought, each displaying their own capacity to perceive the outside world and form thoughts and feelings based on those perceptions. More controversially however, many animals have been shown to display the signs associated with our understanding of sentience (Proctor et al, 2013). This remains controversial as scientific opinions on the level of sentience seen in animals vary (Dawkins, 2000) and there is then also significant debate on what repercussions this should have on welfare practices and our ethical responsibilities.

The concept of sentience is largely ill-defined and much debated in the scientific literature but has nevertheless become a defining point in law, so that animals with the lowest sentience are the preferred object of scientific experimentation (Hobson-West and Davies, 2017). These aspects will be further elaborated on, and a definition of the term "Sentience" will be set out from existing literature in the later sections (Section 2.5). The concept of sentience and how this differs from other terms such as "Consciousness" will also be explored. Sentience is an important point for consideration and a focus of this research is to examine how scientists shape this term (Clayton and Schnell, 2021). A discussion of sentience here examines how our ever-expanding knowledge of animal sentience is and *should* be affecting our attitude toward animal research, due to the increased moral value that sentience may imply (section 2.4). This will then be expanded upon to explore how this concept does or may affect standards of the welfare and ethical review process *in practice* across institutions.

1.1.3 Culture of Care

An animal research institution is deemed to operationalise its values in practice mainly through its culture of care. It is therefore valuable to consider how an institution defines its 'culture of care' and how it is put in place. In a document published in the UK by the RSPCA (2020), 'Culture of Care' is said to describe an establishment-wide commitment to improving animal welfare, scientific quality, care of the staff and transparency for all stakeholders, including the public.

Similarly, the National Consensus Platform and 3R Centre for Norway, NORECOPA (https://norecopa.no/more-resources/culture-of-care) suggests the term "Culture of Care" is "*used in the laboratory animal community to indicate a commitment to improving animal welfare, scientific quality, care of the staff and transparency for the stakeholders*." They go on to explain that each

establishment conveys its culture of care in its own way. There have been several studies/authors that have offered advice for what makes for a good culture of care in the animal research space. According to Gorman and Davies (2020), a good culture of care is about empowering individuals within organizations to care and reflect on wider social expectations about care, going above and beyond the compliance governance. It is now a well-documented aspiration in managing practices of laboratory animal research and establishing priorities for patient and public health, for example see Gorman and Davies (2020).

In the later section (Section 2.2) the literature representing the different understandings of 'culture of care' are discussed with the view to establish common practice across research institutions. Examples of measures introduced for the purposes of a culture of care will be examined, as well as outlining what is generally accepted as a good culture of care within the research community.

1.1.4 Connecting key ethical issues in animal experimentation

This thesis will discuss the themes of transparency, sentience and culture of care in relation to the unique challenges associated with the current animal research public and policy discussions in the UK. The issues examined in this thesis, unlike previous research, do not focus entirely on one of these aspects but instead aim to explore how notions of sentience and sentience knowledge may link to the transparency agenda and how this in turn links to how these aspects are operationalised as part of a wider culture of care. A stance of transparency and openness toward the publication of animal research information opens up the discussion to a wider group of people, who in turn can provide valuable insights to inform decision-making and support reflection on the development of improved practices as a whole.

As an example of the need and role for transparency in the UK, in a recent letter to the Chair of the Animals in Science Committee (ASC), Baroness Williams, who is Minister of State in the House of Lords (Williams, 2020) stressed the importance of the publication of non-technical summaries. Also expressed, was the view that opening up the animal research debate is not just important based on a normative claim of responsibility, but also the UK public's right to know about the research that is being conducted on animals in the UK. Baroness Williams also pressed the instrumental value which recognises the contribution that wider input, engagement and debate can have on research practice as a whole.

These issues of sentience understanding, culture of care and transparency will prove to be vital parts of the public policy equation when considering what makes good practices in animal research. These areas will be examined through the empirical research conducted in this project and will be discussed in further detail in the next section of this thesis before they are examined as part of a discreet empirical ethics piece of this work.

1.2 Research approach

This thesis explores the constructions of transparency, animal sentience and culture of care through an analysis of Institutions' presentations of animal research and the views and attitudes of institutional representatives and researchers, working in a research area that uses animals in research. In order to do this, and achieve actionable outcomes for the research community, the aim of this study is to examine the following research questions:

1) How do UK research intensive institutions deliver their transparency responsibilities?

2) What are the implications of a changing understanding of animal sentience on the duty of transparency, and how do institutions reflect on this aspect in practice?

3) How does an animal infectious disease research community construct animal sentience and how does this link to a "culture of care" within their institutions?

4) What improvements might be made to animal research intensive environments to better reflect the values of transparency, to respect animal sentience and to develop a "culture of care"?

The goals of this study were achieved by collecting data from institutions, and individual scientists. This research was conducted via three streams of data collection:

1) An analysis of the public facing information published by research intensive institutions on their websites that pertained to transparency of animal research activities.

2) A web-based survey directed towards the representative contact points for these institutions that deal with animal research information within their institutions.

3) A web-based survey directed towards a European group of animal research scientists working in the field of animal infectious disease.

The criteria used for the webpage analysis are listed in section 3.1 and the survey questions are provided in sections 3.2 and 3.3.

The analysis of the outwards facing information allowed for the opportunity to assess both the degree of openness regarding animal research information and the quality of the information itself. This analysis also provided an opportunity to identify designated contact points for more information, provided through the institutional webpages, which could then be contacted for the second stream of data collection. Data from the website analysis and both surveys were collated

and used to provide specific details of practices that relate to the concepts of animal sentience, culture of care and transparency and to explore how these constructions may informed inform practice.

2 Key issues in the use of animals in experimentation

Before discussing the methods and the empirical work it is important to discuss the key topics relevant to this research with a view to providing a background to this research. This chapter sets out the context and will discuss animal research by providing a brief history of research, before moving on to the idea of a "culture of care" in research environments. The context and importance of the transparency agenda will then be discussed before ending with an examination of animal sentience knowledge, which is foundational for this study.

2.1 Animal Research

2.1.1 History of Animal Experimentation

There is a long history of non-human animal species being used as models in biomedical research, often historically being seen as a way to overcome social and religious taboos of human dissection (von Staden, 1989). For most, this did not raise notable moral questions, often due to a perceived strict hierarchy of living things, with humans at the top and non-human animals created to serve humankind, a viewpoint that for some still persists today. Similarly, the use of animal experiments for scientific enquiry as both a learning and teaching resource has been prevalent in medical schools around the globe, largely since the Renaissance (Franco, 2013). Under the influence of Cartesian philosophers with views such as of those of Descartes, science was largely provided with grounds to justify experiments which would be considered extreme and unethical under today's standards of the ethical treatment of non-human animals. The reasoning presented was that animals are automatons, mere machines, devoid of pain or suffering (Decartes, 1637), a sentiment which modern science has shown to be false.

Although questions had been raised about the use of animals in experimentation, in the UK wider societal questioning of animal use emerged in the nineteenth century. Anti-vivisection sentiment was particularly strong in the UK in the Victorian era with protests resulting in changes in legislation. The amendment to the Cruelty to Animals Act (1835) in 1876 was the first legislation globally to provide a legal framework for the use of experimental animals. From this point, antivivisection continued to be commonplace, extending to Western Europe and as medical knowledge progressed, there was a transition away from vivisection towards pathology and disease-based research. By the last decades of the nineteenth century, all of today's most relevant arguments on the debate surrounding the use of animals in research had been developed and were being presented, with positions ranging from outright abolition to researchers demanding the opportunity to work without restrictions. During these times, there

were those with concerns that scientists were unable to think ethically about their own work, whilst those involved in research questioned the authority of non-scientists to criticise their work (Franco, 2013). Many of these arguments play out in public and policy debates today.

2.1.2 Bioethics and animal research

The approach used in this research is an empirical bioethics approach. Before discussion of the empirical work and the methods used to collect data on the research participants views of these issues, it is important to set out aspects of the bioethics approach used before moving on and to set out the specific focus of this study and the research questions.

This work is being conducted in the tradition of the framing of bioethics as an interdisciplinary discipline as set out by van Rensselaer Potter (Reich, 1978) and this approach provides a starting point for bioethics research work, although the notion of bioethics as both a subject area and an area of research, that is characterised today has transformed over time (ten Have, 2021).

The term bioethics is comprised of two parts, namely "bio" and "ethics". "Ethics" refers to identification and the study of what is morally right and wrong (Cambridge dictionary) and "bio" places these ethical questions into the context of biology. Thus, bioethics is widely considered to be the study of ethical issues emerging from advances in biology and medicine and the associated policies and practices (ten Have, 2021).

Any scientific advancements characteristically span across many disciplines and are often the result of the work of a diverse group of research backgrounds working towards a common goal. Take for instance, medical drug development; leaps in medical knowledge require an interdisciplinary team with a wide range of skillsets from chemists and data-analysts to the animal scientists and biomedical researchers who have experience of animal use in pre-clinical experimentation. Alongside the researchers there is also a requirement for animal care specialists, such as animal welfare and care technicians and veterinary surgeons. It is no surprise then that such large endeavours would raise a wide range of ethically challenging issues and potential dilemmas. Therefore, there is a need for tools and approaches that can support bioethical discussions as well as frameworks that critically assess if the research is conducted in a manner that balances harms and benefits, is fair and sustainable, whilst maintaining scientific validity.

There has long been an attempt to distinguish bioethics and empirical forms of ethics from traditional ethical theory. The view that bioethics was a form of "applied ethics" was captured in Beauchamp and Childress's (1979) book *Principles of Biomedical Ethics* where they claimed that medical ethical problems could be resolved through the application of four principles: autonomy, non-maleficence, beneficence and justice. They would differentiate these normative principles, which were concerned with determining what ought to be the case, from the empirical work done by social scientists, which they believed simply described how things were and was 'secondary' to bioethics (Wilson, 2013).

Some in the medical ethics field have described a next step in the development of practical, applied ethics, referring to "empirical ethics". Empirical ethics aims to be both descriptive and normative. Empirical ethics differs from morally relevant empirical research as well as from empirically well-informed practical ethics. Empirical ethics combines doing empirical—usually qualitative—(social) research with philosophical (normative ethical) analysis and reflection (Musschenga, 2005; Beauchamp, 2001). A more traditional view of applied ethics, but not representing all positions, may be to suggest that it is the task of legislators and policymakers to reflect upon how to introduce and to implement moral principles in concrete settings, however empirical ethicists reject this view. It has been argued that ethicists should not limit themselves to formulating abstract and general principles and they must specify and operationalize principles for particular contexts (Musschenga, 2005). As a result, an empirical ethics approach allows for a much stronger analysis of a situation on a case-by-case basis and allows for the development of specific outcomes rather than generalised sweeping ethical statements that may not hold water in the real world. In light of this, the research approach for this study is outlined in the next section within the framing of empirical ethics.

In the context of bioethics, reflections on the use of animals for scientific ends have been prominent over the last 50 years, stimulated by the seminal work of philosophers such as Peter Singer (1993;2008) and Tom Regan (1986).

The ethical questions raised by philosophers, scientists and wider publics leads to several questions such as:

a) Is the use of animals in experiments morally legitimate?
b) Do humans have some moral obligation towards animals?
c) Do animals have rights and as such are morally equivalent to humans?

These are some of the overarching ethical questions that have been explored by ethicists over the last few decades and the list of questions is of course not exhaustive, and indeed any analysis and decisions made in the context of ethical reflection will cause new questions to arise with one question leading to another.

An important part of the discussion of the ethical responsibility to experiment on animals is the debate that animals must be respected as having an end in themselves, as living creatures that have intrinsic value. It is argued that human animals should acknowledge that non-animals, as living organisms, have an inherent value irrespective of their usefulness to us as humans. In this way, it would be fair to suggest that animals should be considered "ends in themselves" and not merely as means for the benefit of humans. Regan (1986) has argued that this should be considered to be an absolute argument against animal research, but some have claimed that these two stances are not necessarily at odds. Rollin (2006) suggests that when one goes to a dentist, they are seen primarily as a means to alleviate tooth pain but are never treated as though this is their sole function in life, otherwise devoid of any value. It could be argued then, that applying the same logic to other sentient organisms could be the standard

and our actions should at the very least show a level of respect for the value of a life and the interests of the creature.

Furthermore, a case could be made that humans have a duty to avoid damaging the dignity of the animals in their care as well as avoiding undue physical distress. It could be argued that whilst most would agree humans should avoid causing gratuitous harm, they should potentially also consider refraining from certain actions which could be regarded as disrespectful or morally wrong if applied to other humans. One such example would be humiliating or exposing an animal to ridicule in such a way that they are not directly affected but would be considered morally wrong if done to a human. This would imply that although the animal is not directly impacted, there is a breach of their intrinsic value in some way. This way of thinking is not universally held. Martin (2019) gives her thoughts on the topic, arguing that animals are not capable of being wronged without being harmed. She argues that whilst "not *intrinsically* morally problematic, "harmless wrongs" are only morally problematic if they reinforce "speciesist" prejudices or if they increase the chance of animals having their welfare negatively affected in the future" (Martin, 2019 p.90). She argues that most animals have no interest in not being subjected to such actions and are as such not disadvantaged by them directly.

A classical interpretation according to Kant (1785), is that since animals are not rational, they are not an end in themselves, but rather a means, which would justify their use for human purposes. In this case, attempts to reduce animal suffering would be desirable, which also justifies the quest for the 3Rs (Replacement, Reduction, Refinement) according to the anthropocentric view, as suffering may affect their role as a means. For a Kantian, any experiment can be performed, no matter how painful for the animal.

In spite of the emergence and growing prominence of the animal rights movement since the 1970s, the use of non-human animals in biomedical research continues to occur. Animals were used instrumentally over 50 years ago and their capacity for suffering was considered to be minimal, as demonstrated by the nature of the legislation of the day. However since then it has become increasingly evident that an animals capacity to experience suffering and distress, has increased in both our understanding and in terms of its moral and scientific relevance. There has been an increase in the discussion of the ethical balance that should be struck between the benefits of animal research and due consideration for animal welfare and respect for the animal as a subject of a life (Franco, 2013).

2.1.3 Current Use of Animals in Research

In the UK, the use of animals in research increased noticeably since the introduction of new legislation in the 1980s, especially the Animals Scientific Procedures Act 1986, however in the last 10 years levels of animal use have remained fairly steady and in more recent years has decreased. According to the UK Home Office a total of 2.88 million procedures were carried out involving animals in 2020 (Home Office, 2021). This is a decrease from the previous year as, in 2019, a total of 3.4 million procedures involving the use of animals were

carried out in Great Britain (Home Office, 2020), half of which were used for the creation or breeding of genetically altered animals and half were experimental procedures.

In the UK, animal research experimentation is regulated through The Animals (Scientific Procedures) Act 1986 (ASPA). The Act requires licensing and oversight of the places, projects and personnel involved in the undertaking of procedures. In addition, 2010 saw a new EU Directive (2010/63/EU) come into effect, introducing the need for explicit consideration of the concept of the '3Rs' - Replacement, Reduction and Refinement, when justifying the use of animals for scientific procedures. The 3Rs are enacted through ASPA and the harm / benefit analysis (HBA), which is required by law and is considered in the overall justification for the value of the proposed research work. In the UK, all applications to conduct research using live animals that fall within the scope of ASPA must be reviewed by an institutional Animal Welfare and Ethics Review Body (AWERB). The body, comprising of vets, scientists, animal care staff and lay members, evaluate the proposed work applying the 3Rs and then review the HBA analysis presented by the licence applicants. Licensing is overseen by the Home Office and the designated inspectors but the local AWERBs play an important role.

The 3Rs of animal research- Replacement, Reduction and Refinement were tenants developed by Russell and Birch (1959), to increase welfare standards and minimise the distress of sentient animals used in science. In their work replacement was defined as "any scientific method employing non-sentient material to replace methods which use conscious living vertebrates"; Reduction as "lowering the number of animals used to obtain information of a given amount and precision"; and Refinement as actions taken to "decrease the incidence severity of" procedures applied to the experimental animals. The 3Rs approach has been claimed to provide an ethical and scientific framework on which a common middle ground between the sides of the animal use debate (Hobson-West 2009).

When considering the trigger for the legislation, experimental procedures are deemed to be procedures that are applied to a protected animal for an educational or scientific purpose that may have the effect of causing an animal suffering, distress or lasting harm equivalent to, or higher than the threshold. This threshold is judged to be equal to the level of discomfort caused by the introduction of a needle in accordance with good veterinary practice. In 2020, 96% of all experimental procedures were assessed as sub-threshold, mild or moderate in severity, the remainder of which were non-recovery or severe (Home Office, 2021).

In a survey by the UK government in 2014 (Department for Business, Innovation and Skills, 2014), 68% of 969 respondents agreed that they could accept the use of animals in research for medical purposes where there are no alternatives. Results also indicated that 60% accepted animal usage to help further the understanding of the human body and 64% accepted use to increase understanding of animal health. These figures still show a large section of people who do not accept animal research as ethically justifiable, and this has

historically led to resistance (Huggett, 2008). Whilst the number of such cases of protest has decreased significantly since the 1960's and 70's (Murnaghan, 2014), aggressive protesting continued throughout the 1980's and 90's (Epstein, 2006; Cressey, 2011).

It is clear then that despite ongoing ethical debate, controversy and regardless of notable negative public opinion, animal research continues to play a large role in modern biomedical science. What is important is to examine how views of the scientific community and individual researchers change or adapt as new views on ethical responsibility and the ethical status of animals develop. It is therefore important to be clear about what encompasses research and the nature and practicalities of conducting research in the most ethical way.

When discussing the topic of animal research, it is valuable to be clear about what it encompasses. Rollin (2006) proposes groups,
that define the various activities often found under the banner of animal research into his "six senses of animal research":

1. *Basic Biological Research*
   This is considered to be the formulation or testing of hypotheses about fundamental theoretical questions, not tied directly to any practical case.

2. *Applied Basic Biomedical Research*
   The formulation and testing of hypothesis surrounding diseases, defects or other similar practical issues. Included in this category are procedures such as testing of gene therapy and radiation treatments. Included is this section also, is the advancement of animal welfare and medicine.

3. *Drug and Pharmaceutical Development*
   Rollin describes this category as being similar to the previous, but is distinguished by aiming to discover a specific substance for a specific purpose rather than knowledge, per se.

4. *Safety, Irritation and Toxicity* testing
   Whilst no animals are used to test cosmetics or their ingredients in the UK, this category includes other various consumer goods along with food additives and both industrial and agricultural chemicals.

5. *Use of Animals in Education*
   The use of animals in educational institutions and elsewhere for purposes such as demonstration or dissection.

6. *Use of Animal for Extraction of Products* For example, serum or musk.

Although Rollin's classification is useful, it is not clear about where this would include the number of animals bred for research purposes. This could be included under these categories or as a separate category. It is important to be clear about which activities are referred to in discussions surrounding "animal research" as

arguments that are relevant to one activity may not necessarily be relevant to another, with each exhibiting its own set of challenges in both ethical and practical welfare concerns.

2.2 Culture of care

When discussing animal research, the term "Culture of Care" refers to the commitment an establishment undertakes toward improving standards of animal welfare, staff wellbeing, scientific quality, and reporting transparency (RSPCA, 2020). It is a term that has largely come to be seen as being a foundation of humane and responsible science. However, this term could also be used as a "buzzword" or a way of projecting an aura of care through minimal compliance, without improving on legal minimum requirements (Hawkins and Bertelsen, 2019; McLeod and Hobson-West, 2016).

A culture of care should be thought of as an ongoing journey towards benefiting both the animals and those involved in animal research, rather than a goal in itself. Hawkins and Bertelsen (2019) describe research culture as a house in which optimal animal welfare is the roof. In this model, internal structures such as AWERBs and the application of the 3Rs support this roof and are based upon the strong foundation of a culture of care. The culture of care at every establishment will be different and unique. It should reflect the values of the institution and is largely self-assessed, beyond minimum legal standards set out under ASPA. However, there is limited work on the nature of the culture of care and so more work is needed. Currently there is limited information on the way researchers perceive the culture of care at their institution and how they identify or perceive any differences between establishments. Especially in larger companies, smaller sub-cultures may develop in departments. Perspective can also differ according to the diversity of roles within institutions.

Hawkins and Bertelsen (2019) go on to give examples of indicators of a good culture of care based on the UK regulator's advice on low-level concerns at licensed establishments. There is no published work to see how these aspects map against attitudes to a culture of care:

- High quality condition and care of animals
- Low turnover of staff
- Staff numbers appropriate to the size of the establishment and task
- Quality project documentation
- Openness of all staff: keen and able to answer questions
- Effective designated veterinarian whose input is respected by researchers and care staff
- High quality, effective care staff
- On-going education and training
- Effective communication between care staff and research workers
- Engagement with animal welfare science community
- Well-understood and clear procedure for "whistle blowing"

More generally, a "culture of care" is an acknowledgement of the responsibilities of members of research teams to the animals, to the science and to themselves under a duty of care. Williams (2021) states that care takes two forms: caring for someone (or something) and caring about them. Caring for an animal concerns husbandry practices and ensuring their welfare. Caring about them is different. It is generally agreed that for care to take place the caring about aspect is the most important.

This sentiment is shared and explored by Davies et al (2018) who suggest animal use and animal care are connected through capacities to recognize and respond to the suffering of another and that the traditional cost/benefit analysis alone fails to account for such ethical relations.

As mentioned previously, the idea of a "culture of care" is subjective and more of an ethos than strict guidelines. This research aims to explore issues within institutional culture of care and highlight areas where researchers feel proud of the impacts of the culture of care. Later chapters will discuss these issues through the lens of animal sentience to examine the interconnection, if any, such sentience knowledge has on this culture of care. This may be achieved in part due to the level of transparency surrounding animal research information published by research institutions.

2.3 Reporting and Transparency

It has been claimed for many years that openness promotes advancement of knowledge by allowing scientists to review and criticize each other's work. Indeed, the peer-reviewed system of science is underpinned by the foundation of openness. Openness prevents the intrusion of bias and dogma through cooperation and mutual accountability. Knowledge can be obtained much faster and to a higher standard outside of isolation, through shared resources and methodology (Resnik and Hall, 1998).

Additionally, and perhaps more importantly, it should be acknowledged that science cannot and should not exist in a vacuum. Secrecy can often undermine public trust in researchers and the knowledge they produce. Especially in sensitive areas such as animal research, failure to properly report scientific activities can lead to an erosion of public trust and backlash based on misunderstanding. It is therefore argued that it is vitally important to maintain a balance of ensuring researcher safety whilst providing adequate information to stakeholders, including the public.

In practice, transparency when reporting animal research practice remains a vital component of accountability. However, there are concerns that direct action animal rights groups can try to obtain personal details and information that can identify researchers and use it to target individuals (Festing and Wilkinson, 2007) and as a result organisations have been reluctant to directly name those involved in research in the UK. Although this may be the case, more positively in a UK context, some organisations have begun to continually publish meeting notes for

their AWERBs. As the group of individuals directly responsible for signing off on all research projects involving animals, this important step by the AWERBs gives insight into the decision-making processes behind organisations, which can only serve to further inform interested parties of why certain decisions are made. This serves a dual purpose by first allowing those on the outside to understand the thought processes of those responsible for decision-making, therefore potentially encouraging a more sympathetic stance. It secondarily increases accountability in the decision-making process by making it public. The benefit of this is that more care could potentially be taken by those making the decisions if they are aware the information will be made public.

Similarly, in the UK, reports are published annually by the Animals in Science Regulation Unit (ASRU) (https://www.gov.uk/government/collections/animals-inscience-regulation-unit-newsletters) detailing any and all recognised breaches to the Animals in Scientific Procedures Act (ASPA) (https://www.gov.uk/guidance/guidance-on-the-operation-of-the-animalsscientific-procedures-act-1986).

ASPA (1986) regulates the use of protected animals in any experimental or other scientific procedure which may cause pain, suffering, distress or lasting harm to the animal. The Act sets out what can and cannot be done to animals considered to meet the criteria for legal protections. The ASRU is the government body which oversees the correct implementation of the regulations that control animal experimentation in the UK, set out by the ASPA. Each report summarises on a case-by-case basis the details of the case along with the outcomes and repercussions for those involved in the incident. Reporting of such issues could of course go both ways. It highlights the cases in which, unfortunately, researchers fail to meet their obligations under ASPA and provides ammunition for the relevant protest groups to argue that animal research should be ended. Conversely however, it shows how these cases are dealt with and the repercussions of failing to meet requirements. It would then be down to the individual to determine if this was satisfactory in their own view.

Reproducibility is vital to prevent replication of research and undue animal usage, and as such, correctly outlining the methodological details of a study becomes highly important. Schemes such as the Animal Research: Reporting of In Vivo Experiments (ARRIVE) guidelines can help towards ensuring that research is presented in a way which is favourable in this regard, as well as designed in a manner conducive to animal welfare.

The essence of these reporting standards that aid in the quality of the science being conducted are expanded upon in schemes that try to encourage the integration of the public opinion into the experimental design process such as the Patient and Public Involvement and Engagement (PPIE) one described below.

2.3.1 Patient and Public Involvement and Engagement (PPIE)

As introduced previously, Patient and Public Involvement and Engagement (PPIE) is a term used to encompass the range of different ways in which patients and publics are now being involved in and are engaging with research that involves animals. PPIE is increasingly used in literature to account for the blurred boundaries between the identities of patients and publics, and the practices of involvement and engagement (Gorman and Davies, 2019).

The theory behind this practice can be applied to animal research in the context of different groups approach and understand encounters with animal research in different ways and that motivations and expectations can vary notably. Many lay members see value in opening up conversations about animal research. It can alleviate the anxieties and concerns lay members have about animal research by providing opportunities to learn more about how animals are used (Staley, 2015).

PPIE with animal research is an emerging area, informed by changing cultures of communication and openness around animal research, and the movement of PPIE practices into basic and preclinical research contexts. As a result, these conversations about the realities of research practices can be uncomfortable and there are challenges around how best to communicate and listen. Many have concerns as to how far lay members are listened to and for some, being involved in research that uses animals is an additional ethical and emotional challenge. The move towards greater involvement of the public represents the opportunity to not only deliver potentially better research, but also develop the confidence of lay members and widen their contribution to the harm-benefit analysis of research and the creation and communication of cultures of care (discussed previously in section 2.2) (Gorman and Davies, 2019).

Bearing this move towards increased PPIE in animal research in mind, the publishing of information about these practices alongside wider information surrounding animal research and institutional decision-making processes will create dialogue, which is essential for proper accountability as part of a culture of care. The key principle here being that with more and reliable information about how and why animals are used, people should be in a better position to debate the issues (Festing and Wilkinson, 2007). Recognising this need to promote accountability and transparency in October 2012, more than 40 organisations involved with the life sciences in the UK signed a Declaration on Openness on Animal Research created by Understanding Animal Research (Understanding Animal Research, 2019), 26 of which were universities. They agreed to develop a Concordat that sets out how they will be more open about the ways in which they use animals in scientific, medical or veterinary research in the UK. The objective was to ensure that members of the public have access to accurate and up to date information about what animal research involves, and the role it plays in the overall process of scientific discovery along with how such research is regulated in the UK, and what researchers are doing to promote animal welfare, reduce animal usage and minimise suffering to the animals.

The signatories to the Concordat stated that they wanted people to be able to find out more about animal research so that they can debate the issues from an informed perspective and be able to make up their own minds about animal research (Williams, 2020). The Concordat (Understanding Animal Research, 2014) comprises of four commitments, each underpinned by practical steps that organisations can take, and whilst the exact implementation of the commitment differs between organisations, the commitments are expected to be fulfilled by all signatories. These commitments are as follows:

1. We will be clear about when, how, and why we use animals in research
2. We will enhance our communications with the media and public
3. We will be proactive in providing opportunities for the public to learn about animal research
4. We will report on progress annually and share our experiences

The Concordat provides this set of commitments, but these are broad categories that may be interpreted differently by different institutions and will be implemented in different ways and to different degrees. This study will examine how these commitments are actioned as part of a culture of care and highlight areas where opportunities in the spirit of transparency have been missed.

2.4 Animal Sentience

2.4.1 Historical Understanding of Sentience

This study explored if animal researchers felt that animal sentience played any part in their ethical decision making and subsequent responsibilities to animal welfare. This section will briefly outline the history of the concept and our understanding of animal sentience and how it has changed over the years. The science of animal sentience and consciousness has always underpinned intelligent conversation surrounding animal welfare (Proctor, 2012). The ancient minds of Plutarch, Hippocrates and Pythagoras were known to be advocates of animal welfare, citing their understanding of the capacity of animals to experience suffering (Preece, 2002). By the Renaissance, works of art and literature showed a wider acceptance of animal sentience in society. However, such perspectives of animal sentience are widely inconsistent, with some individuals such as Descartes seeing animals only as "automata", doing things as "expressions of their fear, their hope and their joy, consequently doing things without any thought", though the true intent behind his words is debated (Duncan, 2006; Öhman et al, 2000).

Beyond the Enlightenment, arguments began to challenge existing ideas put forward by those such as Aristotle and Descartes. The founder of Utilitarianism, Jeremy Bentham wrote, "The question is not, can they reason? Nor can they talk? But can they suffer?" (Bentham, 1780). Here Bentham connects an animal's capacity to feel and understand pain, with the acceptance of its sentience. This acceptance of animal sentience carried through the early nineteenth century as people started to recognise senses, docility, memory, association of ideas and reason and moral qualities such as loyalty and friendship (Youatt, 1839). It was also suggested at this time that the difference between human and animal

sentience is a difference in degree and not in kind. These ideas were later adapted to be understood that feelings combine in some way with memories and reason to form a mechanism by which an animal can react to change (Spencer, 1855). Later, post-Darwin, the adaptations to pressures of natural selection were also taken into consideration. Seemingly then, it was commonplace for animals to be thought of as sentient during the nineteenth century.

Much of the twentieth century however was dominated by the behaviourist movement, calling for the idea of consciousness and emotions to be "openly and universally discarded" (James, 1904; Watson, 1928). These powerful figures in the community at the time had a widespread impact on the field of psychology, often resulting in little consideration being given to the ideas of consciousness and feelings (Duncan, 2006). None the less, with time, alternative theories began to arise, such as an animal's affective subjective state has a central role in regulating and directing behaviour (Young, 1959). Since then, research has gone on to reaffirm the importance of research into animal sentience and subjective emotional states (Griffin, 1976; Damasio, 1999).

This stance on the importance of considering subjective emotion states has continued onwards and become an ever-present part of animal science. It serves to not only increase our understanding of animal sentience but also to ensure the ethical integrity of research and has had a huge effect on animal welfare standards. In his book, "Dignity of Human Nature", Burgh (2009) wrote that children ought to be taught that animals can feel even though they cannot complain, and that cruelty to a beast or insect, is as much cruelty, as when exercised upon our own species. Finding objective proof of what an animal is capable of experiencing remains difficult, but a better understanding of such is key to achieving a positive change in attitudes and actions towards animals, as well as permitting significant improvements in animal welfare practice (Proctor, 2012). This section explores how the increase in welfare standards was brought about by the inclusion of our understanding of animal sentience in animal legislation even if the term itself was not used directly in legal text.

The Brambell Committee in the mid-1960s in the UK stated that welfare sentience is a wide term that embraces both the physical and mental well-being of the animal. Any attempt to evaluate welfare therefore must consider the scientific evidence available concerning the feelings of animals that can be derived from their structure and functions and also from their behaviour (Command Paper 2836, 1965). The Brambell Report clearly highlighted the need to consider sentience to meet high welfare standards. Behavioural scientists have gradually accepted the importance of integrating feelings and emotions in their investigations into welfare problems (Duncan, 2006). This is reflected in both animal research experimental design and legislation such as The Animals (Scientific Procedures) Act (ASPA).

Examining the role of the 3Rs and the discussions of sentience, replacement was defined as "any scientific method employing non-sentient material to replace methods which use conscious living vertebrates". Although the 3Rs approach is claimed to provide an ethical and scientific framework on which a common ground

can be found, animal-rights groups do not universally support the 3Rs, since these principles still allow for the use of animals in research. However, the 3Rs framework could be argued to represent an example of a framework developed out of an understanding of the need to consider animal sentience, which has had a positive effect on the standards of welfare for non-human animals directly affected by animal experimentation (Davies et al, 2018).

The 3Rs principles aim to minimise the overall usage of animals and ensure research using animals is conducted only when no alternatives are available. These protections apply to animals that can be shown to be capable of experiencing pain or suffering, meaning they are, in the most part, extended to vertebrates only. However, other amendments in legislation such as the EU Directive 2010 widened protections to include foetuses and some invertebrates such as cephalopods.

Cephalopods are a taxon of invertebrates considered to be one of the most complex of its kind. Often referred to as "advanced invertebrates" or likewise, they exhibit a richness of behavioural capabilities and the ability to adapt their morphology to their niche. Researchers have therefore shown a lot of interest in research surrounding cephalopods and their use in neuroscience research extends for more than a century, largely due to their complex and centralised nervous system and cellular mechanisms of memory. As mentioned previously, as of 2010, significant changes to legislation granted protections to the entire class of molluscs or any "live cephalopods". This covered approximately 700 species for experimental procedures likely to cause pain, suffering or distress and marks the first time these protections had been extended to an invertebrate species (Fiorito et al, 2014).

2.4.2 Constructions of sentience

The different criteria used to determine if an animal is sentient or not are complex and wide ranging. How these principles are used to construct sentience in various ways is discussed here. For the purposes of this study, the different criteria are discussed in three thematic groups: Behaviour, Physical Structures and Emotional Responses.

<u>Behaviour</u>

By observing the behaviour of non-human animal species, scientists have learned a lot about what the subject might be experiencing. Animal sentience research is often accused of being largely mammal centric (Proctor, 2013), though it could be argued that humans are more capable of recognising similar behaviours in the species most similar to our own. Attitudes toward non-human animals have always varied depending on the species' perceived attractiveness, status, usage or believed level of intelligence (Driscoll, 1995). Nevertheless, it is quite often common sense that an animal displaying signs of distress is, for the most part, likely to be experiencing some kind of distress, be it physical or emotional.

The behaviourist movement as mentioned previously, gave rise to the concern of avoiding anthropomorphism, where human characteristics are inadvertently imposed upon non-human animals. Arguments have been made to suggest that humans "project" our own emotions onto non-human animals that do not inherently have the same capacity to 'feel' as we do (Brown, 2015). Similarly, it has been suggested that there is a fine line between empathy and anthropomorphism and care should be taken to prevent misrepresenting the true subjective state of an animal (Kennedy, 1992). However, whilst some avoidance of anthropomorphism is necessary, as it could undermine the value of the science conducted, anthropomorphic tendencies may in many ways be beneficial in natural selection, as the ability to predict and control the behaviour of other animals will undoubtedly aid survival (Kennedy, 1992).

Anthropomorphism is, without a doubt, an unavoidable part of animal sentience science as it plays a fundamental part in our interactions with other animals. This however could be seen as a positive, as our compassion for animals in this way is an important force in meeting our ethical obligations in animal research science. With this in mind, techniques aimed at monitoring the behaviours of animals in controlled situations, and then making inferences based on previous examples and empathy, can be used to further explore the animal mind. A prominent example of this, put forward as evidence of self-consciousness, is mirror self-recognition, which has been demonstrated in a wide array of animals such as great apes, dolphins, and elephants (Gallup, 1970;Reiss and Marino, 2001;Plotnik et al, 2006). The animals deemed capable of self- recognition, display a progression of behaviours similar to that of a human child, which start to develop between 14 and 24 months (Amsterdam, 1972).

Physical Structures

To be deemed sentient, an animal must be capable of feeling subjective emotional states and perhaps the most easily identifiable of such, is pain or distress. As such, brain size and the presence or absence of a cerebral cortex have often been thought to correlate with sentience. Some have even gone as far as to suggest the absence of a cerebral cortex makes the perception of pain impossible (Rose, 2002). However, this has been proved to be inaccurate as new studies have come out demonstrating the capacity of non-mammalian animals without a cerebral cortex to feel emotions and perceive pain (Broom, 2007). Even within mammals, it appears that cerebral cortex size has very little correlation with both overall intelligence and basic emotional complexity, with evidence suggesting emotions are produced from the sub-cortical regions of the brain (Broom, 2004; 2007; Cavalieri, 1993; Striedter, 2016).

Fish have often been used as an example of the debate between where a hypothetical "sentience line" should be drawn. Whilst fish are often covered under legal protections, many have argued that fish are incapable of suffering entirely because of the distinct differences in physiology and behaviour to that of a human. This however is largely disputed by literature comprising of a number of studies demonstrating nociception in fish (Sneddon, 2003). Furthermore, Braithwaite and

Huntingford (2004) concluded in their review that fish showed all the signs of having the capacity for both nociception and pain perception, going on to suggest that the pain experienced may not be the same as that of a human but is still largely important to the fish and should be reflected in their welfare standards.

It is important to consider the differences between the respective species, since the suffering caused to a given animal can be greater than that caused to other species. Singer illustrates the issue as follows: "If I slap a horse's flank with my open hand, it may be startled, but it probably will not feel a great amount of pain. Its skin is thick enough to protect it from a simple slap. But if I slap a baby in the same way, it will cry and will almost certainly feel great pain, since its skin is more sensitive. Thus, it is worse to slap a baby than a horse, as long as both slaps involve the same force" (Singer, 1994 p69). He admits further that there is no precision when one compares suffering amongst different species, just as there can be no exactness in the comparison amongst different individuals (Singer, 1994 p71). Thus, any exploitation of other animal species could be considered an example of speciesism, which according to Cavalieri and Singer (1993), is not morally justifiable. He goes on to say speciesism is comparable to racism: "Human speciesists do not admit that pain is as bad when felt by pigs or rats as it is when human beings feel it."

In human society, in a visit to the doctor for something like a flu jab it can be expected to hear "This may sting a little" or "You may feel a slight pinch". This understanding of the level of pain about to be received allows someone to mentally prepare for what is to come. They would know that the discomfort about to be received is mild and temporary. Even in more extreme cases such as fixing a dislocated shoulder for example, where the pain is likely to be more severe, the understanding that the pain is likely to be somewhat brief can allow someone to deal with that level of discomfort in a way that would be very different if they had no such concept of time. It therefore follows that if a non-human animal were to truly "live in the moment" it could experience the subjective state of pain to a more distressing extent than it would if it were aware the pain would be temporary. Critics of this idea may well cite anthropomorphism, however referring to the avoidance of anthropomorphism on this topic, Mendl and Paul (2008) argue the very reason we are motivated to ask such questions about the mental lives of animals is precisely because of our own subjective experiences.

Animals, time and time again, continue to be shown to possess the capacity to experience pain in their own way. Stimuli that are considered painful in humans have been shown to induce similar physiological and behavioural changes in other nonhuman mammals. Birds display increased heart rate and withdrawal behaviours after being exposed to negative stimuli. The administration of morphine has been shown to reduce animals response to noxious heat in quails (Sneddon, 2014). Finally, Tye (2016) described how there are significant and interesting commonalities between insect brain structures and those of mammals.

Defining sentience by cognitive ability could also prove to be potentially harmful for the welfare of animals that do not have the physical structures deemed to be associated with sentience. Animals capable of experiencing suffering through

different means than our own cognitive ability could be disregarded and subjected to lower welfare standards. If research was to show that in actuality some invertebrate species were able to experience pain and/or display signs of consciousness, then we would have to challenge the assumptions made about animals and reflect on the legal and moral placement of the ethical divide between vertebrates and invertebrates. Precedence for this type of shift has been demonstrated in recent years with cephalopods which have now been shown to be highly intelligent, sentient beings and as such were included under the protections of the UK Animals (Scientific Procedures) Act (1986) (Smith et al, 2013).

Emotional Responses

Whilst perhaps the most difficult to demonstrate objectively, testing for subjective emotional states other than pain or distress can show an animal's capacity for more complex, higher emotions. Whilst care will be given to avoid anthropomorphism, this paper will refer to the subjective emotional states of non-human animals as their closest human equivalent. The naming of perceived animal emotions with the same labels as human emotions, paints a better picture of the experiences of an animal and does more for the argument for compassion than a sterile scientific term does (Proctor, 2012). When looking for subjective emotional states in non-human animals, there are various methods that can be used to investigate the feelings present in animals indirectly. These include but are not limited to preference testing, motivational testing and seeking to develop an understanding of animal communication.

As mentioned previously, there is some evidence that animals may possess the ability to consciously both re-live past events and imagine future ones, referred to as mental time travel (Mendl and Paul, 2008; Tulving, 1993, 2002). These forward and backwards components are known as episodic future thinking and episodic memory respectively. Episodic memory is well studied and a rapidly evolving topic for those involved in human psychology (Squire and Zola, 1998; Tulving, 2002). In the context of the present study, this research shall focus on how an animal's potential for mental time travel affects its capacity to be sentient, and how this could be reflected in welfare.

The experience of transporting consciousness back to the time of a previous experience is called "autonoetic" consciousness (Tulving, 1985). It is also referred to as "self-knowing" consciousness as it necessitates an understanding of a resulting "self" that existed in the past. In a similar vein, episodic future thinking requires both the capacity to imagine and the capacity to place "oneself" in a possible future experience. If an animal were capable of mental time travel, a researcher could cause it to experience fear for as long as it can see the pain coming. The animal would therefore be hurt for as long as the pain lasts, in addition both to the distress of recollected pain and anticipation for future pain and for as long as the memory lasts. Tulving also goes on to suggest this implies "every hurt is multiplied, as it were, by three— in fact, if we wanted to be quantitative, perhaps by much more.''

The difference between having or not having a concept of "self" could be seen as the difference between experiencing ''I feel pain'' as opposed to ''this is painful''. At the time of the pain, suffering is likely to be of a similar intensity in both instances. The fact that the pain is being experienced by 'me', a person with a clear self-identity, rather than just 'being experienced' may have little impact on the welfare (Mendl and Paul, 2008). However, the capacity to either recall a painful experience from the past or to worry about the future, is likely to affect the welfare of an animal. If an animal were to mainly live in the present, they would lack the capacity to dwell on previous experiences. They would therefore be unable to experience any subjective state in relation to this, be it positive or negative such as suffering or grief. It could be argued as such that animals living in the present might therefore lack the capacity to feel the emotional repercussions of their past in the same way as humans do. Such thinking would suggest that an animal incapable of episodic memory would be unable to experience human phenomena such as Post Traumatic Stress Disorder (PTSD). This would be highly relevant in welfare terms as it would have to be considered in procedures. Episodic future thinking, or future mental time travel could potentially mean an animal would be subject to becoming preoccupied with the future in a similar capacity to that seen in humans. Subjective states such as worry, and anxiety could severely affect the quality of life of an animal. Lacking the capacity for episodic future thinking could protect animals from such states, but it is also possible that certain cues could be associated with unpleasant past experiences due to conditioning (Raby and Clayton, 2009).

2.4.3 Defining sentience

In reviewing the literature surrounding animal sentience, it is clear that there is a lack of consensus in terms of definitions for terms such as sentience and consciousness. In a review by Proctor et al (2013) it was suggested there is no universally accepted definition of sentience due to the difference in opinions as to where sentience exists in the animal kingdom (Proctor, 2013; Turner, and D'Silva, 2006). It is valuable to explore some examples of the variety of definitions used in this area before describing which definitions will be used for the purposes of the current research.

The definition of sentience according to the Online Cambridge English Dictionary is "the quality of being able to experience feelings". However, sentience has also previously been defined as the "Capacity of an animal to have feelings, and to be aware of a variety of states and sensations such as pleasure and suffering" (Proctor, 2012) or "Ability of animals to feel and experience emotions such as joy, pleasure, pain and fear" (Proctor, 2013). Alternatively, Theise and Kafatos (2013) define sentience as "sensing of the surrounding environment, complex processing of information that has been sensed, (i.e. processing mechanisms defined by characteristics of a complex system), and generation of a response". It is clear that there are different constructs of the precise meaning of the term sentience, with definitions often caught somewhere in between outlining an organism's ability to feel emotions and its capacity to experience suffering, and this is made more complex when the word is used interchangeably with the word "Consciousness".

Consciousness is defined as "the state of understanding and realizing something" (Oxford dictionary) but has also been defined as "Giving an animal information about its internal environment" (Duncan, 2006) and "subjective awareness" (Bogen, 1995). Consciousness is seen as something similar to an "inner eye" that allows the animal awareness of certain inner states such as fear and pain. In light of the variation in definitions, for this study sentience will be defined as:

> "The capacity of an animal to have a subjective awareness of oneself and subjective emotional states or feelings, including such things as pleasure and suffering."

and consciousness defined as:

> "The state of being aware of, and able to, respond to external and internal stimuli".

Considering the earlier review of the different criteria animal research scientists use to determine sentience and consciousness, these definitions were chosen to help create a clear distinction between the two terms and reduce their interchangeability. All of the information set out in this chapter acts as the foundation for this research.

This notion of sentience discussed throughout this section will underpin the focus of this study. If animals require considerations due to their sentience, we should see this having an effect on welfare standards, as well as their use needing to be justified. This research aims to consider if sentience is considered a part of a culture of care in animal research institutions, and if researchers feel they are meeting their ethical responsibilities as a result. How this will be achieved in the study is outlined in the following methods chapter.

3 Methods

This chapter will outline the methodological process undertaken to achieve the goal of this project, and how and why these decisions came about through the course of the research project. The chapter chronologically describes the steps taken for data collection through the three main streams of research, specifically content analysis of webpages, a targeted institutional survey, and a survey of members of the animal research community.

This section will provide an outline of the analytical processes used and a justification for their respective use in this research. Throughout the course of this research, a number of changes had to take place due to the challenges of the COVID-19 outbreak. In order to explore the issues of transparency, an assessment of the compliance to the Concordat was conducted. To explore concepts of the three aspects of transparency, sentience, and culture of care, and with the limited potential for face-to-face interactions, two online surveys were conducted. This research approach was chosen as a more appropriate way to collect data from institutional representatives and researchers during the COVID restrictions.

Two of the three empirical components of the research involved human participants, and as such the research method was reviewed by the University of Nottingham School of Sociology and Social Policy Research Ethics Committee (SSP REC) and received a favourable ethical opinion.

3.1 Method to Assess Concordat Compliance

As highlighted, there is an important need for openness and transparency which is linked to a culture of care (section 2.3), therefore this research investigated to what degree institutions responded to this responsibility. As such, an examination of the outward facing information published by animal research intensive universities was conducted. The subjects of this analysis were comprised of the 26 University signatories of the UK Concordat for Openness, who signed up initially in 2014. The analysis of this outwards facing information was conducted to assess both the degree of openness regarding animal research information and the quality of the information itself. This sets a baseline understanding of the degree to which reporting certain aspects of information is important at an institutional level and provides a valuable comparison when examining the individual researchers views and positions.

3.1.1 Sampling

Purposive sampling was employed for the webpage selection process. Purposive sampling allows for cases to be chosen because they illustrate a specific feature the research is interested in (Denzin and Lincoln, 2000 cited in Silverman, 2020). For this research, the first university signatories of the Concordat were chosen for analysis as they should have represented the best examples of openness and transparency, after being a part of the Concordat commitment for the longest. They all represent the institutes that were potentially more motivated to get involved in the Concordat project initially, being the first group to sign up. It was

therefore expected that these universities would prove to be valuable sources of information surrounding animal research.

3.1.2 Access

The online information used in this analysis was freely accessible to the public and required no special access or freedom of information (FOI) requests. The use of FOI requests was considered as a potentially useful source of information if responses from the web-based surveys were low. To address the difficulty of finding a suitable start point for internet document analysis, this research used the links provided by the institutions themselves to the latest Concordat report document. This allowed for the institutions to point directly at the information they were choosing to put forward to the public.

Although the initial scope of the webpage analysis included an analysis of the Animal and Plant Health Agency (APHA)[5], the decision was made to focus this research solely on university institutions as a sample group and exclude government and private commercial research institutions. Future research may wish to include these groups as this could provide a useful comparison with university institutions.

3.1.3 Data Collection

Webpages are potential sources of qualitative and quantitative data and therefore can be subjected to analysis (Bryman, 2012). As Flick (2014) notes, there are several practical considerations that must be made when analysing internet documents:

- What exactly needs analysing?
- The main page or all of its links?
- Where does one begin in the non-linear layout of a webpage?

When developing the criteria for data collection these challenges were considered by examining how the information was accessible (see Section A of table 1). For example, the information being located mainly on one dedicated page allows for much easier analysis as one can simply start at the top and work down the page. Ensuring all the information present on the institutions' websites is critical to the validity of this research so every effort was made to find relevant information. If information was not discovered during the course of the research, it might suggest the information was not easily accessible and therefore not in keeping with the goal of accessibility for the sake of transparency. Webpages additionally pose the challenge of being subject to change and at times disappearing entirely. With this in mind, analysis was conducted during a short time frame, between 1 March – 31 March 2020. The results from this section of research are therefore reflective of

[5] Plant Health Agency (APHA)
(https://www.gov.uk/government/organisations/animal-and-plant-healthagency/about/research)

the webpages standing at the end of March 2020 and could be subject to change after this time.

Additionally, a second analysis was conducted during the month of March 2021. This allowed for comparison between the two years and refreshed the current standing of the information published by the institutions. It was noted during this stage of analysis that it was not possible to go back and examine the webpages as they appeared in March of 2020. It was therefore decided that screenshots of the information presented on the university webpages should be taken and preserved. All the information discussed in this research should therefore be present or notably absent in the screenshots, aiding in the reproducibility of this analysis.

Whilst existing literature highlights the possibility of using webpages as data sources, there were not any existing methodologies for a project focussing on analysing the information published by university signatories of the UK Concordat on Openness on Animal Research in the UK. Therefore, a novel assessment protocol needed to be developed. The protocol criteria consisted of three sections designed to assess the outward facing information for the 26 university webpages provided on the 2018 Concordat Report published by Understanding Animal Research (Williams, 2018).

The criteria (table 1) were developed in response to the requirements of the Concordat and what it deems should be present, in addition to the AWERB Guiding Principles published by the RSPCA, which suggests principles of good practice (RSPCA and LASA, 2015). Related criteria were grouped into sections. Section A focused on how many options of finding data were available and if the overall presentation of the information is organised in a way that is easily accessible. Section B detailed what information linked to animal research is present on the webpages provided by each university. The final section, Section C, focused on assessing the level of information provided about animal sentience knowledge, and how this is taken into consideration at the establishment.

Table 1: List of assessment criteria for animal research institution webpage content analysis

Section A
1. Did the link from the Concordat report work?
2. Can the information be found using a search engine?
3. Can the information be found using internal search functions?
4. Was the information located mainly on its own dedicated page?
5. Was there a clear and direct link to or mention of the information on the main research page (universities) or home page (institutions)?
6. Link to the concordat provided?
7. Link to the most recent Concordat report provided?
8. Link to Understanding Animal Research provided?
Section B
9. Are members of their animal research staff named?
10. Minutes from AWERB meetings?
11. Published AWERB Meeting Dates?
12. Are animal usage statistics provided?
13. Are figures compared to the UK as a whole?
14. Was there any information on licencing provided?
15. Was there information on ASPA provided?
16. Was there any information on 3Rs?
17. Was there any information on the ARRIVE guidelines?
18. Were there any contact details to get further information if needed?
Section C
19. Is there any reference to sentience on the page?
20. If so, how does this affect welfare?
21. Is there any reference to intrinsic value of the animals?
22. If so, how does this affect welfare?

Further to this, some criteria were split into multiples in order to become more specific. An example of this is "Was there any information regarding legislation?". This became points 14 and 15 which focused on searching for information regarding licencing and ASPA, respectively. The first criteria assessed whether or not the links provided to the Concordat were functioning. A link was deemed to be functioning if it directed specifically to a page regarding animal research information. In some cases, the links would not work when clicked but would work when copy and pasted into a web browser. These links were deemed as functioning. For a link to be deemed non-functioning, it must therefore have not directed to a main animal research page when either clicked or copy and pasted into a web browser. To validate the protocol and further guarantee reproducibility,

additional assessments of a randomly chosen university webpage were carried out on separate occasions by different individuals including an independent lay individual and the results were compared to the original findings.

3.1.4 Analysis

For the website criteria, a quantitative approach was required. Some of the criteria initially included a degree of interpretation in the assessment of the questions which meant. A decision was made to alter the criteria to remove any potential for interpretation or "grey areas" and have the criteria target whether the information was either present, or not present on the webpage. This leant itself to the quantitative analysis as totalling the amounts of entries there were present and not present, or "Yes" or "No" respectively, gave a numerical value that could be compared.

Additionally, from analysis of the webpages, league tables were developed to best show how the institutions compared to one another. Creation of these league tables was achieved by ordering institutions via the number of criteria deemed to have been met, and secondarily by an overall impression. This overall impression was assigned to a "RAG" (Red, Amber, Green) system and is largely subjective and should be considered less significant. It was generated to give a general sense of a website's accessibility, readability and the detail of the animal research information provided. As a result of the decision to remove less robust criteria by making criteria largely "is the information present or not", many institutions have received the same scores. The position in the tier lists between these Universities has been assigned based on differences in overall impression where applicable, but otherwise the exact position is interchangeable and should be thought of as such. This will be discussed further later in this thesis (Section 4.1.1).

All data from this section of research was gathered manually. This meant a reviewer looked at all the available information across the webpage and compared it against the criteria provided. The results were then stored in an Excel spreadsheet. This allowed for easy organisation of the data and subsequent generation of the graphical content of this report. Flick (2014) suggests that analysing documents alone gives a very specific and somewhat limited approach with regards to experiences and processes. However, the data can prove to be particularly effective when used alongside interviews, surveys, and other supplementary observations. With this in mind, additional streams of data collection in the form of online surveys were used to fortify the observations made from the website analysis as well as to expand upon researcher experiences in practice.

3.2 Institution Online Survey

In order to meet the aim of this research and gain more in-depth understanding of the operationalisation of the aspects of transparency, sentience, and culture of care in practice, the second phase of the project involved contacting some of the institutions analysed previously for further comment. This was achieved using web-based surveys.

Online surveys are designed and delivered using the internet. The use of these survey tools is becoming increasingly common in research. Their advantages are appealing to surveyors as they allow for rapid development and administration of surveys, fast data collection and subsequent analysis, are low cost, and lead to fewer errors due to manual data entry than telephone or mailed questionnaires. Indeed, Maymone et al (2018) stated that internet surveys may be used in clinical and academic research settings with improved speed and efficacy of data collection compared with paper or verbal survey modalities.

More broadly, a survey was chosen for this stage of research "*for the purpose of constructing quantitative descriptors of the attributes of the large population of which the entities are members*" (Groves et al, 2009; p. 2). These 'quantitative descriptors' imply not only 'numbers' but also their interpretation, which in turn is placed in a broader interpretative frame (Joye et al, 2016). This broader frame helps to build a picture of the current standing of the values of the institutions and their implementation. Although limitations such as potentially low response rates, demographic biases, and variations in computer literacy and internet access remain areas of concern, respondents are assumed to provide meaningful and correct answers to questions presented in a survey format. Whenever this is the case, a survey can help answer the given research question (Jann and Hinz, 2016).

Surveys can generally be used to study various types of research questions in the social sciences. One important precondition is that researchers translate their research questions into corresponding survey questions that measure the concepts of interest. This process of operationalization is critical and needs thorough consideration. The advantages and disadvantages of survey methodology considered during the course of this research is best summarised in Table 2.

Table 2. Advantages and disadvantages of Web-based surveys (Table adapted from Maymone who developed it from Wright (2005) and Dykema et al. (2013)).

Advantages	**Disadvantages**
• Rapid development • Fast administration • Flexible questionnaire design • Low cost • Access to traditionally hard-to-reach groups • Low data entry errors • Possibly higher data quality compared with other survey modalities	• Sampling biases • Self-selection bias • Internet access required • Computer literacy required • Relatively lower response rates • Technical problems

3.2.1 Sampling

The second stage of research data was obtained by contacting the institutions involved in the website analysis for further comments via an online Microsoft Forms survey. These organisations provide their contact points on their public facing websites.

3.2.2 Access

These contacts were established via the links provided on the animal research pages, identified as part of the website content analysis. The individuals targeted for this survey were those listed as the designated points of contacts by the institution webpages.

3.2.3 Data Collection

The survey was designed to take approximately 25 minutes to complete and comprised of 15 questions, with a number of open question that provided respondents with the opportunity to expand on their comments.

Also considered during the formation of the survey questions were key principles of design (detailed in Table 3) that can help to increase survey participation and improve the accuracy of responses according to Dillman et al (2014):

1. Consider whether using a Web-based survey is appropriate for your research project. Design a research question requiring input from a population with access to the internet.
2. Write a brief introduction including the study goals and investigators involved.
3. Create a concise, easy-to-understand, and "eye pleasing" screen that allows questions to be easily visible and read in entirety.
4. Make sure the font size and spacing are adequate for easy readability. Be consistent with wording and style.
5. Avoid horizontal scrolling and visually distracting backgrounds.
6. When possible, avoid open-ended questions.
7. Consider allowing the option of "not applicable" as an answer choice.
8. Check for possible biases in the wording or order of questions. Consider randomization of questions to avoid priming respondents, or place opinion questions toward the beginning of the questionnaire to prevent bias.
9. Avoid similar or overlapping answer choices. Consider listing choices in alphabetical order.
10.Pilot test the questionnaire to evaluate feasibility, validity, and reliability.
11.Pre-test the Web survey before going live.
12. Carefully check the e-mail list for duplicate e-mail addresses. Consider choosing Web-based survey tools that are able to block duplicate responses from the same IP address.

The survey was designed to work in conjunction with the information provided by the webpage analysis and as such covered similar themes. The questions were divided into three themes - openness and transparency, the effects of animal sentience knowledge and culture of care in practice on animal research. Table 4 outlines the questions provided to the participants during the survey.

Table 4: List of questions given to questionnaire participants

(A) General Questions on Openness on Animal Research in your Research Institute
1. How would you describe the quality of your public provision of information on the use of animals in experimentation at your university as described on your website?
2. How regularly do you review / update your public facing website information on the use of animals in experimentation at your university?
3. Who is responsible for updating your institutional online information on animal experimentation? Please add their job title or role.
4. Do you think your public information on experimental animal use should be provided on your Institutions main research page?
5. How important is it to your institution that the public are informed about your animal work?
6. Is the institution ever hesitant to publicise your research involving animal and what is the primary reason for this?
7. As well as your own animal use figures, do you publish UK wide information to provide context for your animal usage statistics?
(B) Questions on a Culture of Care related to Use of Animals in Research
8. Do you refer to a "culture of care" at an institutional level and is that shared as part of your approach to Openness on Animal Research?
9. How could a culture of care approach be improved across the sector?
10. Do you have examples of a positive experience that has resulted from your institutions culture of care, and have you shared these publicly?
(C) Questions on Animal Sentience related to Use of Animals in Research
11. How does your institution engage with and / or considers the concept of sentience in your work involving animals?
12. Do you think the changing understanding of sentience in recent years has affected the care of animals involved in animal experimentation?
13. What effect, if any, has or does the concept of sentience have on your approach to Openness on Animal Research in in your Research Institute?
14. Do you think there should be some mention of animal sentience on institutes webpage when they report on animal research?
15. Do you think your institution publicly publishes a satisfactory level of information regarding sentience?

Ensuring anonymity for those taking part in the survey was extremely important and valued. All survey results were submitted to the Microsoft Forms survey anonymously and in many cases the researchers did not know the name of the person to which the survey was sent. Each of the participant's contact information was provided directly by the webpages, many of which had generic contact emails addressed to the AWERB or an ethics review committee. The data was gathered in a way that could not be linked to a specific participant. All participants were assured that they reserved the right to request their data was not used, and they could withdraw from the study at any time up to the analysis of the data. Participants were also advised that any information provided regarding illegal activities would have to be reported. The surveys were made and completed in Microsoft Forms in compliance with the University of Nottingham's data security policy and the Data Protection Act (2018). As stated previously, ethical review was conducted by the University of Nottingham, School of Sociology and Social Policy Research Ethics Committee (SSP-REC) and finalised before any data of this nature was collected.

3.2.4 Analysis

Many of the survey questions sought a longer, more detailed response from participants than a simple yes or no. There was a wide range of responses that required an analytic process that provided a structure for identifying key information from these responses.

Thematic analysis is a method for identifying, analysing, and interpreting patterns of meaning ('themes') within such qualitative data (Clarke and Braun, 2016). It provides accessible and systematic procedures for generating codes and themes from qualitative data. Codes are the smallest units of analysis that capture interesting features of the data (potentially) relevant to answering the research questions. Codes are the building blocks for themes, (larger) patterns of meaning, underpinned by a central organizing concept - a shared core idea. Themes provide a framework for organizing and reporting the researcher's analytic observations. The aim of thematic analysis (TA) is not simply to summarize the data content, but to identify, and interpret, key, but not necessarily all, features of the data, guided by the research question. The hallmark of this form of TA is its *flexibility* – not simply theoretical flexibility, but flexibility in terms of research question, sample size and constitution, data collection method, and approaches to meaning generation. This proved to be particularly useful for the online surveys as there was no way of knowing how many invitees would respond (Vaismoradi, 2013).

Thematic analysis is especially useful for this research as it can be used to identify patterns within and *across* data in relation to participants' lived experience, views and perspectives, and behaviour and practices; 'experiential' research which seeks to understand what participants' think, feel, and do (Clarke and Braun, 2016; Vaismoradi, 2013).

3.3 Researcher Questionnaire

The third and final phase of the data collection was conducted in parallel to phase 2 (institutional questionnaire) and involved a questionnaire sent to members of an animal infectious disease research network.

3.3.1 Sampling

The final source of data for this study was collected using a Microsoft Forms survey sent to members of an animal infectious disease research network, named VETBIONET (https://www.vetbionet.eu/). The participants were purposely sampled based on their area of research, use of animal models, interest in wider ethical and regulatory questions related to animal research and the relationships with this project's supervisors which facilitated access. This ensured the questionnaires would reach members of a research community with the correct level of subject knowledge and experience for this research. The survey was designed to take approximately 30 minutes to complete and comprised of 27 questions, with additional opportunities to expand on their comments.

3.3.2 Data collection

The survey was designed to work in conjunction with the information provided by the webpage analysis and alongside the institutional survey and as such cover similar themes. However, this questionnaire was more extensive in scope with questions divided into background questions and the following five themes: Societal Impact of Animal Infection Disease Research, Concepts of Sentience, Welfare and Sentience, Sentience and Culture of Care and Transparency, Public Engagement and Sentience.

Table 5 outlines the questions provided to the participants during the survey.

Table 5: List of questions given to the VetBioNet researcher participants

Background
1. What is your role within your organisation, in general terms?
2. Approximately how long have you worked in this field of animal infectious disease?
3. What do you see as the overall value of this area of research work?
4. What made you decide to work in this area?
Theme 1- Societal Impact of Animal Infectious Disease Research
5. From your perspective, what is the most significant societal benefit from Animal Infectious Disease Research?
6. Do you think the research community does enough to communication about the value and contribution of this research area?
7. Please can you list at least 3 societal benefits from the VetBioNet research work

8. Are you involved in or know of any work that assesses the economic or societal impact of animal infectious disease research? Please include references and weblinks, if referring to published reports or papers.
9. Do you think the current COVID-19 pandemic has changed public views of the value of Animal infectious disease research?
10. Do you think the current COVID-19 pandemic has changed public views of the role and value of the use of animals in scientific research?
Theme 2 – Concepts of Sentience
11. What does animal sentience mean to you?
12. Do you see animal sentience as distinct from consciousness?
13. If yes, how does it differ?
14. Please describe what animals you consider to be sentient.
15. How often would you say you actively engage with the concept of animal sentience in your work?
16. Where do you get your information about animal sentience from?
Theme 3 – Welfare and Sentience
17. Are there any aspects relating to the welfare of the animals in your care that you are particularly pleased about or proud of? If so, please describe them.
18. Are there any aspects relating to the welfare of the animals in your care that you find challenging? If so, please describe them.
19. Are there any aspects relating to animal welfare that you would like to change and in what way? If so, please describe them.
20. In general, how do you think understanding of sentience has affected or changed animal welfare approaches in animal experimentation?
21. Are you satisfied with the level of enrichment provided for the animals in your care?
22. If not, what would you like to see change?
23. In general, how do you think that sentience has affected the level of enrichment provided for animals used in experimentation?
Theme 4 – Sentience and Culture of Care
24. What does the term 'Culture of Care' mean to you?
25. Are you satisfied with your institutions approach to 'culture of care'?
26. If not, what would you like to see change?
27. Through which activities or approaches does your institution demonstrate a culture of care?

28. Biomedical research is sometimes seen as ethically challenging. What approaches or tools does your institution put in place to help scientists and animal care staff deal with any ethical issues raised?
29. When considering your own ethical values and positions, how similar or difference are your ethical views on approaches to animal use in experimentation when comparing these to your institution's approach and policies?
Theme 5 – Transparency, Public Engagement and Sentience
30. Are you aware of the Basel Declaration, 2010 advocating greater transparency in animal research (https://www.basel-
declaration.org/basel-declarationen/assets/File/Declaration/Declaration_en_Z%C3%BCrich.pdf) or the UK Concordat for Openness in Animal Research (https://concordatopenness.org.uk/)?
31. What are your views of the Openness and Transparency in Animal research agenda?
32. How would you rate your institution for openness and transparency?
33. Do you think your institution provides a satisfactory level of information regarding animal welfare and / or sentience?
34. How important is the public's perception of your work to you personally and across your research community?
35. How important is it to you that the public are informed about your work?
36. What approaches, activities or communication strategies do you think could be used to improve public communication on the use of animals in research?

Due to knowledge of this research network, the decision was made that there could be more questions than in the previous survey. This provided an opportunity to examine further details on topics and to ask about more specific questions that related to some aspects of subjective experiences. With the previous survey it was expected that the responses gained would be more generic and focused on the institutional level, however this network provided an opportunity to get perspectives from individual researchers and allowed an analysis of their perspectives.

3.3.3 Analysis

The responses from this questionnaire were subjected to the same thematic analysis as presented for the institutional survey. Due to the sensitive nature of the work involved in this research, additional effort was made to review the responses and preserve the anonymity of the participants. All survey results provided through Microsoft Forms were anonymised, and privacy was considered to be of the upmost importance. However, as the participants were accessed via VETBIONET, it may continue to prove to be difficult to ensure complete anonymity.

This is a result of having a limited data pool from which members may know each other and recognise the speech patterns of individuals when quoted. Similarly, members may have felt obliged to participate because of their involvement with the project. To combat this, all participants reserved the right to request their data was not used and to withdraw from the study at any time up until the data was analysed and published. Participants were also advised that any information provided regarding illegal activities would have to be reported. These ethical issues were thoroughly analysed and managed appropriately with full consent of the project management team who reviewed the questionnaire and gave permission in advance for circulation of the questionnaire.

3.4 Validity

External validity describes the extent to which conclusions which a study reaches are likely to be relevant in other cases and contexts. Until a researcher was to actually replicate a study in other contexts, it is impossible to know for certain whether or not the conclusion will be the same between outcomes. It is therefore important to stress that it is a matter of debate around the point of whether it is "likely" that the outcome will be relevant in other similar research (Shadish et al, 2002). Therefore, it is not enough to suggest that the study reported here lacks external validity on the grounds that it is not known whether the conclusions made will be the same in other situations, but instead this report will try to highlight areas that may impact the generalisability in such a way that would be convincing to others with knowledge of the subject matter.

Whilst it is impossible to exhaustively assess the questions of external validity, this section of the report will focus on considering the main factors affecting the generalisability of the study against the scope of the research aspired to by the researchers. As mentioned previously, some of participants were targeted due to their expertise, experience, and the research team's ability to access the participants. This would not allow for a wider generalisation about the views of a larger public as these individuals will almost certainly have a much greater level of knowledge on the subject matter, but these participants provide professional experiences and perspectives, with that said the community of professionals is still narrow and provides some validity challenges. Therefore, the selection of participants involved in the study represented a notable challenge to external validity for this study. Due to the nature of the methodology used and inherent biases that could be argued for in the individuals contacted for purposive sampling, it would be difficult to justify that the conclusion drawn would be representative of scientific researchers as a whole. However, it should be noted that the recruitment methods are not intended to provide a representative or random sample of all researchers or of course 'publics'. The results carried out using the methodology are set out in the next section.

4 Results

The result section presents the three components of empirical work, are presented in the order in which the data was collected, starting with the webpage analysis, and then concluding with the results of the two surveys.

4.1 Assessment of Universities Websites Compliance with the Concordat

The data from the website analysis is presented, for coherence, in terms of the three categories of questions described in the methods section. All of the 26 Signatory Universities had a webpage that related to animal research and therefore were included in the analysis.

The first section of questions (Section A) focused on the accessibility of the information as well as what, if any, additional useful information relating to the Concordat was linked to from the respective webpages. The second part (Section B) focused on the quality of the information provided on the webpages across both years. This includes basic information regarding animal research licensing and usage statistics, as well as further information such as AWERB meeting dates and published minutes. The final section C focused entirely on references to sentience and its effects on practices. Across all of the responses, there was only one mention of sentience on one of the webpages. This was the case for both years of analysis.

Table 6: Results for section A (Accessibility) of website analysis. This table shows the amount of university webpages that were judged to have met or not met each criterion.

2019 Concordat Report				
	Total Yes	Total No	Total Yes %	Total No %
Section A	-	-	-	-
Did the link from the 2019 Concordat work?	18	8	69	31
Can the information be found using a search engine?	26	0	100	0
Can the information be found using internal search functions?	25	1	96	4
Was the information located mainly on its own dedicated page?	24	2	92	8
Was there a clear and direct link to or mention of the information on the main research page (universities) or home page (institutions)?	3	23	12	88
Link to the concordat provided?	9	17	35	65
Link to the most recent concordat report provided?	1	25	4	96
Link to Understanding Animal Research Provided?	22	4	85	15

2020 Concordat Report				
	Total Yes	Total No	Total Yes %	Total No %
Section A	-	-	-	-
Did the link from the 2020 Concordat work?	22	4	85	15
Can the information be found using a search engine?	26	0	100	0
Can the information be found using internal search functions?	24	2	92	8
Was the information located mainly on its own dedicated page?	26	0	100	0
Was there a clear and direct link to or mention of the information on the main research page (universities) or home page (institutions)?	2	24	8	92
Link to the concordat provided?	12	14	46	54
Link to the most recent concordat report provided?	0	26	0	100
Link to Understanding Animal Research Provided?	23	3	88	12

Table 7: Results for section B (Quality) of website analysis. This table shows the amount of university webpages that were judged to have met or not met each criterion.

2019 Concordat Report				
	Total Yes	Total No	Total Yes %	Total No %
Section B	-	-	-	-
Have they named any members of their animal research staff?	7	19	27	73
Minutes from AWERB meetings?	6	20	23	77
Published AWERB Meeting Dates?	6	20	23	77
Have they provided their animal usage statistics?	19	7	73	27
Have they said how this compares to the UK as a whole?	2	24	8	92
Was there any information on licencing provided?	20	6	77	23
Was there information on ASPA provided?	23	3	88	12
Was there any information on 3Rs?	26	0	100	0
Was there any information on the ARRIVE guidelines?	20	6	77	23
Were there any contact details to get further information if needed?	13	13	50	50

2020 Concordat Report				
	Total Yes	Total No	Total Yes %	Total No %
Section B	-	-	-	-
Have they named any members of their animal research staff?	8	18	31	69
Minutes from AWERB meetings?	5	21	19	81
Published AWERB Meeting Dates?	7	19	27	73
Have they provided their animal usage statistics?	22	4	85	15
Have they said how this compares to the UK as a whole?	2	24	8	92
Was there any information on licencing provided?	21	5	81	19
Was there information on ASPA provided?	23	3	88	12
Was there any information on 3Rs?	25	1	96	4
Was there any information on the ARRIVE guidelines?	21	5	81	19
Were there any contact details to get further information if needed?	15	11	58	42

Table 8: Results for section C (Sentience) of website analysis. This table shows the amount of university webpages that were judged to have met or not met each criterion.

2019 Concordat Report				
	Total Yes	Total No	Total Yes %	Total No %
Section C	-	-	-	-
Is there any reference to sentience on the page?	1	25	4	96
If so, how does this affect welfare?	0	26	0	100
Is there any reference to intrinsic value of the animals?	0	26	0	100
If so, how does this affect welfare?	0	26	0	100

2020 Concordat Report				
	Total Yes	Total No	Total Yes %	Total No %
Section C	-	-	-	-
Is there any reference to sentience on the page?	1	25	4	96
If so, how does this affect welfare?	0	26	0	100
Is there any reference to intrinsic value of the animals?	0	26	0	100
If so, how does this affect welfare?	0	26	0	100

4.1.1 A comparison of Concordat compliance over a two-year period

Not all criteria produced differing scores between the two assessed years, however there were some noticeable differences. These differences are presented in Table 9.

Table 9: Differences in Concordat Compliance between the two years of analysis per question

Question	Number of Changes	No to Yes	Yes to No
Did the link from the concordat work?	8	6	2
Was there information on ASPA provided?	4	2	2
Were there any contact details to get further information if needed?	4	3	1
Can the information be found using internal search functions?	3	1	2
Link to the concordat provided?	3	3	-
Have they provided their animal usage statistics?	3	3	-
Was the information located mainly on its own dedicated page?	2	2	-
Overall Impression	2	1	1
Was there any information on licencing provided?	1	1	-
Link to the most recent concordat report provided?	1	-	1
Link to Understanding Animal Research Provided?	1	1	-
Have they named any members of their animal research staff?	1	1	-
Minutes from AWERB meetings?	1	-	1
Published AWERB Meeting Dates?	1	1	-

4.1.2 Overall Ranking of Compliance to the Concordat

Once the original data for each year was mapped and assessed it was then collated across the two years, and the total number of criteria met was calculated. Table 10 displays the University's ranking in order of criteria met for both Year 1 (2020) and Year 2 (2021) of data collection and analysis. The table displays the 26 University Concordat signatories that were analysed. The top Universities in the rankings met the most criteria out of the 22 assessed. In situations where Universities met the same number of criteria as another, the final order was decided using the coloured rating system. This rating system is an assessment representative of the general layout, presentation, and accessibility of the webpage. The webpages were assigned a "band" associated with a colour. Webpages in the "Red" band were assessed to be lacking in overall presentation. This could be due to a number of reasons. The information on the webpage could have been judged to be difficult to find due to the layout of the webpage. Additionally, webpages falling into the "red" band typically had minimal information and a lack of other features conducive to openness and transparency such as virtual tours. Webpages falling into the "Green" band were assessed to be of high quality. These typically had the information well laid out in an accessible fashion as well as a presenting additional features and information surrounding animal research. "Yellow" band webpages fell in between the two other bands and typically had some additional information and features.

It is acknowledged that ranking in this way is subjective and should be interpreted as such. However, it was used as a way to decide which University, when identical scores were allocated, should appear higher in the list. In reality, when specifically referring to the data from this analysis, there is little difference between institutions with similar scores. For example, RVC London appears higher in the list than The University of Manchester as its overall presentation was judged to be better. However, where universities are jointly ranked as there is no difference between their colour ranking, they were judged to be equal. For example this is true for Imperial College London which appears above RVC London, yet they met the same number of criteria, and both achieved a "green" rating.

The scores from the Universities ranged from 6 to 14 out of a possible score of 22 for Year 1 and from 6 to 15 for Year 2. This range remained fairly consistent across both years. The tier list ranking was generated to demonstrate some of the small differences and allow for an easily digestible overview of current standings. The next section sets out the overview of the full breakdown of the webpage analysis per criteria point across both years (see table 10).

Table 10: Universities ranked by amount of criteria met across both years of analysis

2019			
Name	Total Yes	Total No	Rating
Leicester	14	8	
Nottingham	13	9	
Stirling	13	9	
Birmingham	12	10	
Cambridge	12	10	
Edinburgh	12	10	
Imperial College London	12	10	
RVC London	12	10	
Manchester	12	10	
Bath	11	11	
Queen Mary	11	11	
Aberystwyth	11	11	
Dundee	11	11	
UCL	11	11	
Bristol	10	12	
Cardiff	10	12	
Open University	10	12	
Kings College London	10	12	
Oxford	9	13	
Plymouth	9	13	
LSHTM	9	13	
Strathclyde Glasgow	9	13	
Newcastle	8	14	
Brunel London	7	15	
Portsmouth	7	15	
Aberdeen	6	16	

2020			
Name	Total Yes	Total No	Rating
Cambridge	15	7	
Edinburgh	14	8	
Manchester	14	8	
Stirling	14	8	
Leicester	13	9	
Nottingham	13	9	
RVC London	13	9	
Bath	12	10	
Birmingham	12	10	
Queen Mary	12	10	
Bristol	11	11	
Cardiff	11	11	
Open University	11	11	
Plymouth	11	11	
UCL	11	11	
Aberystwyth	11	11	
Imperial College London	10	12	
Dundee	10	12	
Kings College London	10	12	
Oxford	9	13	
LSHTM	9	13	
Portsmouth	9	13	
Strathclyde Glasgow	9	13	
Newcastle	8	14	
Brunel London	7	15	
Aberdeen	6	16	

4.2 Institution Survey

This section presents responses from the institutional survey and responses from individuals representing the contact point for the institutions analysed in the website analysis phase of this research. The survey was sent to contact addresses sourced from the webpages asking for a response. Not all webpages provided contact addresses. Therefore, of the 26 websites analysed previously, 15 were contacted for further information, so of the original signatories of the Concordat, only 58% provided a contact point for enquiries about animal use. With an initial invitation and one reminder, only three organisation had responded. This is a response rate of 20% of those organisations contacted. The responses from the representatives are coded as IR(x) (short for Institution Response) with X being an assigned number. These respondents were therefore numbered IR1, IR2 and IR3 respectively. Below is a breakdown of the key themes that arose from their responses.

4.2.1 Transparency themes

Participants of the survey were asked questions regarding their views on the current standing of the level of transparency reflected in the animal research information published on their institution's website.

When asked to describe the quality of their public provision of information on the use on animals in experimentation, two institutions self-reported as being "Average" and one chose the "Excellent" option. One of the respondents that chose the "Average" option went on to say, *"We are currently in the process of updating our webpage information which is due to be up in the next few weeks". [IR3]*. All respondents agreed that public information on experimental animal use should be provided on their institutions main research page. The desire to see this in practice is evident with one response saying:

> *"…I would like the route by which you find information about animal research to be more easily accessible/obvious from our university main research page soon."* [IR3]

All respondents took the view that providing the public with information around animal research is important to some extent. One response chose "Important" and two chose "Extremely Important". When asked for further comment on this issue however, some respondents felt this value was yet to be realised, for example:

> *"Our current website does not reflect the importance we place on keeping the public informed, hence we are re-vamping our website to make it more informative and contemporary"* [IR1]

Responses across multiple questions that probed how regularly the organisation reviews or updates the website information, mentioned a need to update pages or that "*updating our webpage information which is due to be up in the next few weeks". [R5]*. All of the responses expressed that their respective websites were updated at least once a year, with "*publications listed as they arise". [IR2]*

When asked to consider the level of hesitation involved when publishing information of this nature, two of the three respondents indicated no awareness of any hesitation toward publicising their research involving animals. The third respondent however highlighted that:

> *"The comms team were hesitant as many of them received media training in the days when anti-vivisection activity was high. We have addressed this directly with the help of UAR."* [IR1]

4.2.2 Animal sentience

A number of the questions directed toward the participants concerned animal sentience, with questions focused on learning how the institutions framed and approach animal sentience and what implications their framing of sentience may have on aspects such as transparency and wider practices.

Sentience and Openness

Two of the three respondents indicated they were happy with level of animal sentience information published by their institution, with one respondents saying, *"Not currently, but we aim to do so"* [IR3] in regard to publishing more information. Participants were asked if they felt aspects on animal sentience should be mentioned as part of their published information on research involving animals. In response, one of the respondents chose the response "No". When asked for comment on their response, they provided the following:

> *"I'm not sure this helps the message. Public* [are] *aware of animal sentience and I suspect in some cases consider all animals to have same degree of sentience as humans. To provide mention of animal sentience may risk us informing public that animals are less sentient than they think, which could be seen as a negative message to justify research."* [IR1]

The other two respondents indicated that they felt there should be a mention of animal sentience on webpages as part of animal research information. However, *"the word sentience is not always specifically used."* [IR2]. When asked what effect the concept of sentience had on their institutions approach to openness, the responses to this question generally did not indicate that the institutions identified or wanted to identify a link between sentience and openness, rather they had found it to affect the way the public interacted with information:

> *"The concept of sentience doesn't affect our approach to Openness, but we are aware of the public having an increased concept of sentience and so having more of an interest in what happens to animals in research." [IR1]*

Sentience in practice

Participants were asked if they felt the changing understanding of sentience in recent years had affected the care of animals involved in animal experimentation. Respondents suggested that there had been some effect on animal care and welfare across establishments, as illustrated by this answer from one respondent:

> *"In the animal facility we have always been mindful that our animals may be more sentient than has been proven scientifically and so have always looked to provide them with the highest standard of care regardless of species."* [IR1]

Participants were also asked to reflect more broadly on how their institutions engage with or consider the concept of sentience. The responses indicate different levels of engagement with the concept of sentience across the institutions. One respondent replied that *"sentience is a key consideration when identifying opportunities to refine animal experience."* [IR1]. Another respondent [IR2] indicated:

> *"All our animals in research are provided with the highest standard of care and welfare in accordance with the code of practice. They are always provided with varied enrichment within their living areas and handled with the most up to date best practices. We have a 3Rs working party that introduce new projects addressing the replacement, reduction and refinement of animals used in research. All of our researchers are requested to review the 3Rs during their projects and share best practice with their colleagues. Considerations of the five freedoms is factored within the daily monitoring of animals welfare."* [IR2]

This respondent did not mention sentience directly, but this statement includes reflection on care and welfare alongside a comment on the importance of the 3Rs. The final respondent [IR3] responds to this question indicating the importance of care (as for IR2) but also reflects directly on the concept of sentience and what it means for their staff as well as considering whether there needs to be more direct consideration of sentience in their practice:

> *"At our establishment I believe the standard of care and the understanding of animals has been very high for a long time, with the staff who work directly with animals certainly understanding the concept of sentience and incorporating it into the way that they work with animals. However, there is no official institutional engagement currently with the concept of sentience and this is something we will have to raise at our next AWERB."* [IR3]

4.2.3 Culture of Care

Participants were asked to reflect on their institutions culture of care, how it is implemented, and how 'Culture of Care' could be improved across the sector. All respondents indicated that their institution referred to a "culture of care", but chose to express this in different ways:

> "*We do refer to it during key meetings (such as AWERB) and it is mentioned on our website but no* details or examples." [IR1]
>
> "*Yes, we have defined our own Culture of Care within the institution, ensuring that the public are informed of the scientific output is embedded within the definition of a good culture of care."* [IR2]
>
> "*Yes - everyone who is involved in animal work whether it is HO based or not is provided with an induction which includes an explanation of our culture of care."* [IR3]

A number of contrasts in views were presented across the respondents. One institution felt there needed to be *"some easy measurables" [IR1*] whilst another felt it should be left up to organisations to define their own culture of care, *"otherwise they won't know how to promote it and comply."* [IR2]

One respondent suggested "*giving the local training module to people not directly involved in animal work, e.g. to Estates staff. This would increase their awareness of HO requirements and would hopefully increase their response time to HO related building work."* [IR3]

4.3 Perspectives of Researchers

There were seventeen respondents in the Research Network survey and all of these responses were included in the analysis. The survey was sent to all named members of the VetBioNet community by email (n=58) and received a good response rate of 29%. Of the 17 responses not everyone responded to every question. It should be noted that as a result of this sample size, many of the conclusions should be treated tentatively. In future, further study could expand upon the findings of this research to ensure validity. Each of the 17 participants was assigned a participant number. The responses from this survey are coded as RR(x) (short for Researcher Response) with x being the assigned number. These numbers range from R1 through to R17. A breakdown of the responses is provided below.

Profile of Respondents

Whilst the survey was mainly targeted at those who were directly involved in animal research, other members of the community could respond to the survey as they saw fit. One of the respondents [RR6] stated they were not directly involved in animal research, but their research was considered to be linked to animal work. Therefore, their insights are included in this report where appropriate. The participants of this survey spanned a variety of roles within their

respective institutions, from senior scientists and pathologists to department heads and CEOs. The average time working in the area of animal research for the participants of this survey was just under 17 years, with some having 3-5 years of experience and other experienced participants having worked in research area for up to 35 years.

A key portion of the survey focused on exploring participants views regarding the openness and transparency agenda in animal research as for the institutional survey and the ways which information is conveyed in order to reach this goal.

Communication on Animal Research

When asked if the research community does enough to communicate about the value and contribution of animal research, four responses said "Yes" whilst the other 13 said "No".

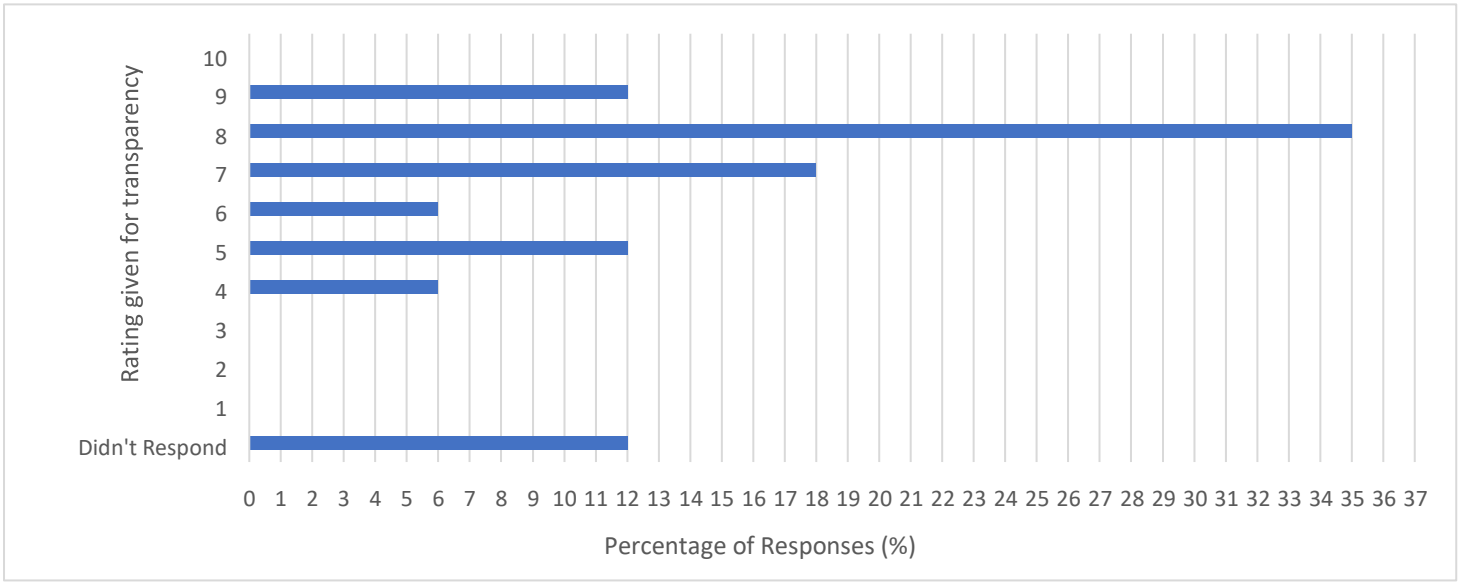
A common theme amongst the respondents was that researchers are *"often not well trained to do this"*, [RR3] or that *"only few scientists are blessed with these skills" [RR11].* Another issue that was raised by this question was that there were a lot of difficulties in explaining information due to it being such a *"niche expertise" [RR5]* and that a lot of information is often *"incident driven"* [RR7] with a lot of "*misconceptions and prejudices about of animal research among the general public" [RR4]*. Another respondent said that *"people involved in research activities usually are very busy not only with research activities also with administrative issues so have few times to communicate in an adequate way the value of this work." [RR12]*. Other respondents suggested that there is concern about the public perception of animal research, for example, *"too much information may inform negative social reaction"* [RR16] and a general "*fear of the current banishment of animal experimentation by our society and more particularly our politicians"* [RR13].

4.3.1 Views on Transparency

Overall, the responses to the topic of transparency were positive, supporting the agenda as being *"a good starting point" [RR2]* and *"necessary for societal acceptance" [RR3].* Beyond this however, many responses expressed concern over the difficulties of meeting the agenda as "*a lot of the research is very complex, and so is the ethical justification of animal experimentation"* [RR1]. Some responses indicated that there is concern about the misuse of information such as… *"raw data can be misrepresented or misused by non-specialists" [RR5]* as part of an *"activist 'framing' of science". [RR7].* Comments suggested that "*Openness and Transparency must be seen as pillars of the Animal Research agenda*." [RR14] Another respondent stated, *"we should not fear politicians and society to communicate on animal research -including animal experimentation- and explain that we save animal and human lives with animal experimentation."*
[RR13]. However, some caveats were expressed stating that animal research *"should be communicated in an integrated way free from 'fake news' and political window dressing." [RR7]*

When asked to rate their institutions on a Likert Scale of 1 to 10 for transparency and openness, the mean rating was a seven (see Figure 1). However, the most common rating given by participants was an eight. No participants rated their institution lower than a four. Two participants did not respond to this question.

Figure 1: Results from the self-evaluation of institutions for openness and transparency on a 10-point scale.



Participants were asked to clarify their answers with additional comments. Many used this as opportunity to state they were satisfied with the level of transparency at their institution. One response said that their rating was *"dependant on the audience"* [RR16] indicating that the information may not be accessible to everyone in the same way. One respondent however expressed concerns over publishing information:

> *"Although I realize how supportive my Institution is about animal experimentation, and all the efforts that it provides to allow us doing animal experimentation in good conditions, I also feel that communicating on what we do is considered touchy and we are asked to be very discrete. This can place some people - in particular, staff in charge of animal care - in difficult positions sometimes."* [RR13]

In responses related to the provision of information, 14 participants responded that they felt their institution did indeed publish a satisfactory level of information regarding animal welfare and sentience, some going as far as to mention *"research units that are fully dedicated to these topics"* [RR14]. One response to this question however revealed that they felt that they went beyond the legal requirements, but that there was room for further improvement: *"In front of the authorities. But can be improved"* [RR1].

When asked to reflect on ways to improve public communication on animal use, a range of different ideas were suggested. These have been condensed into a number of key sub-themes:

- Educational television shows (n=2)
- Social Networking and social media publications (n=5)
- Expert participation in television discussion and podcasts (n=2)
- Presenting more case studies of actual research (n=4)
- Online meetings and conferences (n=3)
- Increased access to scientific publications (n=2)
- Increased use of photos and videos rather than just text (n=2)

A common theme amongst some of the responses was a lack of consensus about who is responsible for disseminating this type of information. Some respondents suggested institutions needed to provide more resources or specialist expertise to enable better communication. For example, one respondent indicated that institutions should "*invest money to employ communication specialists and develop a strategy*" [RR1] and another said that there should be a *"dedicated dissemination team for public communication"* [RR16]*.*

4.3.2 Perceptions of Sentience

As discussed earlier, the literature indicates there is a lack of consensus surrounding a solid basis for the term sentience. Participants were asked to discuss this term and what it meant to them as researchers before other more specific questions expanded upon the role of this concept in practice.

Defining sentience

Participants were asked to consider what the term 'animal sentience' means to them. There was a range of responses to this question, with a number of themes identified. The most commonly expressed theme was 'capacity to feel', highlighted by the response of one respondent [RR2] or some degree of *"the capacity to feel (fear, pain, happiness, etc.)".* The degree to which "pain" and "suffering" are mentioned in the responses varies but it was common for respondents to discuss the ability to feel pain or to suffer as important parts of defining sentience here.

In the responses to this question there was also a lack of consensus as to whether or not *"experiencing"* or *"sensing"* different feelings was enough or if being *"aware"* of these sensations was critical. For example, one respondent went into quite a lot of detail considering the complexities of the term:

> "*The ability to respond to stimuli (including noxious) is ubiquitous in the animal world including invertebrates and immature life forms, and to some extent all can learn by conditioning. This is essential to motivate nutrition, reproduction, and survival of the individual and/or the species. Sentience would refer to perception of these stimuli at an integrated level, with different levels of complexity and awareness. We tend to take an anthropocentric view on this, but in reality, we do not really know*." [RR7]

Sentience vs consciousness

When asked about the difference between animal sentience and consciousness, twelve respondents felt that there was a distinct difference between sentience and consciousness whilst four participants did not. Many participants did not feel there was a direct link between the two terms with responses such as "*there can be animal sentience in animals that do not possess consciousness"* [RR2] and "*animal sentience is clear to observe, consciousness more difficult. I am uncertain how much these terms depend on each other."* [RR1]

One respondent went on to state that these were two "*different cognitive functions*" [RR5]. Others however disagreed with this point and suggested that there is a link between the two, with comments such as:

> "*Sentience is only part of the umbrella term consciousness"* [RR14]
>
> "*Animals are capable of sensation and experience suffering but they are not consciousness how this occurs."* [RR12]

And further explorations from one respondent focused on the nature of sentience, *specifically:*

> *"Maybe consciousness is the primary process of data acquisition and sentience the data analysis? Sentience results in emotional reaction."* [RR15]

These terms did not appear to connect or be a common usage term for one of the respondents [RR11] as they had difficulty understanding these two terms. They suggested that terms in their language may have "*similar but not identical meanings*".

Defining the limits of sentience

When asked to consider and describe what animals they consider to be sentient a range of responses to this question were provided. One response simply said *"all mammals"* [RR6] whilst others went on to add qualifiers to this. For example,

> *"all mammals, birds but may be even all vertebrates up to some extent"* [RR1] or "*I consider all mammals and birds to be sentient, I am insufficiently familiar with others and have to rely on the judgment of others."* [RR15]

A common theme amongst the responses was that vertebrates were considered to be sentient, whether or not the term itself was used. In contrast, one respondent said, "*All that have centralized nervous system."* [RR12]. There were however four responses that went as far as to include more than vertebrates as sentient. One response extended their considerations to:

> *"live non-human vertebrate animals, including independently feeding larval forms and foetal forms of mammals as from the last third of their normal development; and also, live cephalopods."* [RR3]

Another went on to include:

> *"all animals, in different ways (sentience is critical to adapt and survive as a species). Sentience is not synonymous with the ability to suffer, that is also dependent on consciousness and goes beyond the impact of stimuli, suffering can also be described as a state of mind that negatively affects the quality of life beyond the 'normal'."* [RR7]

Engagement with sentience

When asked the question how often the participants actively engaged with the concept of animal sentience in your work, one respondent said they never engaged with the concept and two said they did so on rare occasions. Most said they interacted regularly with the concept, though mostly only when using animals and the extent to which they engaged depended on the species being used. Two of the respondents responded saying they *"don't actively engage with the concept, but always try to make the experiments as optimal for the animal's welfare as possible"* [RR9] and similarly *"we haven't done yet purposely but think that we intuitively do so when planning a study or determine conditions and handlings in a study"* [RR15]. It was interesting to note, one of the participants had not heard of the word "sentience" before [RR8].

When asked about the source of their information, participants got their animal sentience information from the following sources:

- Scientific literature (n=5)
- Veterinary education and personal experience (n=4)
- Participation in ethic committees (n=1)
- Wikipedia (n=1)
- Welfare groups such as RSPCA (n=3)
- Institutions such as NC3Rs, Home Office (n=1)
- Personal discussion with colleges and conferences (n=3)

One participant however responded, *"I do not actively seek information for animal sentience"* [RR13]. Whilst another shared their concerns:

> *"Up to this survey I wasn't aware of it but will have look in future. However, I am not sure that we will achieve objective criteria and therefore there is quite a risk of subjective interpretation."* [RR15]

4.3.3 Culture of Care

A number of aspects of culture of care were examined through the series of questions and most of the respondents engaged with these questions.

Defining culture of care

When asked to express what the notion of culture of care meant to them, most described that implementing culture of care is left largely to the individual institutions. With this in mind, it was therefore unsurprising to see a variation in focus amongst the respondents. The responses can be summarised into three

subcategories: Value-focused, Animal-focused and Lack of Engagement with the concept.

Responses falling under the umbrella of value focus talked about, for example, having a mindset where *"everything can be improved"* [RR2] and *"all involved share moral values, apply these in their daily work and communicate across roles and responsibilities about the work but also values and concerns."* [RR7]
Some responses said their culture of care was animal focused with "*animals deserving the greatest attention, including during experiments"* [RR3]. These responses also sometimes made specific reference to *"reducing animal suffering" [R12]* and accounting for *"the value of the animal". [RR9]*

Finally, the last theme amongst the responses was that some researchers had not come across or actively engaged with the term "culture of care" before, or instead were purely focused on animal welfare. This was the case in three of the 17 respondents:

> "*No meaning (I don't come across this term)."* [RR4]

> *"Not affected by it in my workplace; personally, I see this as something that should be obviously implemented*" [RR6]

> *"As a researcher/user I am not so much concerned by this. I believe that each animal experimental facility has a "Culture of Care" approach that stipulates a responsible and respectful mindset and a high-standard animal care policy."* [RR14]

<u>Implementing culture of care</u>

When asked about their views regarding their institutions' approach to 'culture of care', eleven respondents indicated they were happy with their institutions culture of care and three respondents said that they were not. In addition, three participants did not respond to this question. When asked to comment further on their response there were some interesting comments, which again highlight the diversity in institutional and individual approaches to the concept of culture of care:

> *"Young staff has much culture of care than the "old style" animal technicians"* [RR2]

> *"Little understanding of animal needs and feelings"* [RR8]

> *"Better preparation so each animal experiment can be used by several researchers"* [RR16]

> *"Big challenges are presented by the international character of the research community also translating to staff, discrepancies between institutional policies (e.g., saving on investments), scientists, oversight bodies and technical staff are in permanent need of improvement. not only regarding animals."* [RR7]

When thinking about approaches to demonstrate culture of care, several activities were noted by respondents:

- Personal initiatives (n=1)
- Training activities (n=4)
- Seminars (n=1)
- Active and demanding ethic committees (n=2)
- Focus on 3Rs (n=3)
- Exchange of best practice (n=1)

The participants were asked to consider their own ethical values and positions and to reflect on how similar or different these ethical views on approaches to animal use in experimentation are in comparison to their institution's approach.

The majority of the responses indicated that they felt their own ethics were in line with their institutions. One response went on to say that they felt this would *"depend on the size and mission of the institution".* They suggested that *"medium scale, single purpose institutions may be optimum for this."* As "*corporate values, structures, governance and culture are key elements to the positive but also negative."* [RR7]

One particularly notable comment was:

> "*This is a tricky question. I think, during the past 20 years, I have learned to conform my personal ethical values to the institutional or regulatory requirements (which in the end are based on scientific progress). Having accepted that animal experimentation is inevitable in my research, I have always tried to cope with the prevailing standards (which were unfortunately not so high 20 years ago) and I have readily accepted any increase in the regulatory requirements. Still, in retrospect, I must say that, during my early career, I have performed some animal experiments that do not actually match my ethical values*." [RR14]

<u>Effects of having a culture of care</u>

When asked to name any aspects relating to the welfare of the animals that the participants cared about or were particularly pleased about, most of the respondents expressed appreciation for high levels of environmental enrichment. In addition to this, "*pain relief*" and "*novel husbandry techniques*" [RR5] were given as positive aspects of animal welfare, with particular focus on "*preventing animals from suffering*". [RR13]

Some of the responses compared the welfare standards of animals in research with other fields, such as "*those in conventional farming systems*". One participant said:

> "*animals used for scientific purposes are well protected by legal and scientific requirements, typically much better than animals in other contexts (domestic or wildlife)*" [RR2].

When asked about the welfare of the animals in their care and if they found any aspect challenging, common challenges raised by respondents including (n=11/17):

- Restraining animals (n=3)
- Isolation of animals (n=1)
- Defining end points for experimentation (n=1)
- Monitoring animals and measuring animal stress (n=6)

Some respondents also raised the issue of there being a limit as to how far these measures can go or that they are representative of practice in the industry:

> *"When inoculating animals with highly pathogenic agents (e.g. HPAIV, ASFV), severe disease outcomes (incl. suffering and death) are not only inevitable, but also part of the experimental readout. "[*RR14]

> *"Target animal studies under farm conditions are always in line with the current legislation on farm animal management and husbandry, but conditions are less comfortable and under economic pressure. "[*RR15]

When asked how understanding of sentience has affected or changed animal welfare approaches in animal experimentation. Many responses again referred to "naturalistic" [RR4] environmental enrichment as being a major development over the past decade or so, for example one respondent noted that it was a *"huge implementation of a measure to improve animal welfare in the last 10 years."* [RR2].

Additionally,

> *"Knowing the sensitivity of animals makes it possible to take better account of their suffering and therefore better prevent it."* [RR3] This is seen in practice as *"methods for suppression are less painful and anaesthesia is always required."*[RR2].

More generally, one response said*,*

> *"Understanding and the acceptance of sentience has increased the burden on the shoulders of researcher carrying out such studies. Hence it has led to more reflection."* [RR11]

However not all respondents agreed the effects were all for the best. In response to this question, one participant wrote;

> *"It has changed the opinion about animal experimentation. It has also changed societal demand for breeding conditions (outdoor, no drugs etc) without taking enough consideration of other stress this can bring (for example more exposition to infectious agents)"* [RR12]*.*

When asked to further comment on their thoughts about the enrichment provided to animals in their care, 11 participants said they were satisfied, four participants felt they were unsatisfied with the level of enrichment provided for the animals in their care and two participants did not respond. When asked for the reasoning

behind their answer, some highlighted enrichment specific issues that they would like to see improved:

- *"Possibility to give fresh fruit/vegetable to the animals"* [RR2]

- *There is an "intrinsic tension between the need for standardisation for optimal experimental design and customizations for optimal welfare/enrichment practices."* [RR7]

- *"Technical solutions for waste disposal."* [RR15]

- *"Currently efforts to increase bedding are difficult to realize for farm animals, especially when working with high virulent pathogens. Another aspect is also the translatability of optimal husbandry conditions to outcomes in field conditions."* [RR15]

The diversity of these responses, the ethical significance and further interpretation of these results across the three empirical activities are discussed in the next section.

5 Discussion

The findings from the empirical work have presented a range of interesting aspects that complement and add to the existing literature and identify how and why the findings are valuable for the current animal research debate and openness and transparency agenda. The key themes drawn from the thematic analysis of the research data will be discussed and links between the key aspects of this research will be explored in order to reflect on the research questions raised at the start of this study, specifically:

1) How do UK research intensive institutions deliver their transparency responsibilities?

2) What are the implications of a changing understanding of animal sentience on the duty of transparency, and how do institutions reflect on this aspect in practice?

3) How does the animal infectious disease research community construct animal sentience and how does this link to a "culture of care" within their institutions?

4) What improvements might be made in animal research intensive environment to better reflect the values of transparency, respecting animal sentience and develop a "culture of care"?

First the findings of the website analysis primarily will be addressed but this section will also refer to pertinent points raised in the surveys that relate to this analysis. The survey findings and linkages to institutional transparency will then

be explored in greater detail when discussing the findings of the surveys. This chapter concludes with a summary of themes and a discussion of the possible outcomes from this research.

5.1 Institutional Responses to Transparency Agenda

Change is facilitated and supported by institutions. Individuals can be agents for change but new ideas, initiatives, and challenges to reflect on the ethical values need to be embraced by organisations and institutions. How institutions operationalise values and support ethical reflection in practice has a significant impact on change and this is true for ethical issues in terms of animal use in research (RSPCA, 2020). The first part of the empirical work within this study focused on analysing the response of institutions to their ethical commitment to transparency as expressed through their compliance to the UK Concordat. The results will be discussed in three sections, relating to criteria used in the analysis, each with its own theme.

5.1.1 Information Accessibility

The outwards facing animal research information published by the institutions in this study was, for the most part, deemed to be accessible for the 2020 data. 85% of the links from the latest Concordat report worked, which can be viewed as fairly high due to the fragile nature of weblinks. It is also a noticeable increase from the previous year where 69% of links were found to be functional. This allows the Concordat report to function as a resource and a suitable starting point for interested parties to identify and compare the institution with the transparency agenda. This, combined with the fact that all the information could be found via a search engine across both years, means that there should be little preventing someone from finding the desired information. A limitation which could be improved is the lack of promotion of this information on the main research page of many university websites. In the 2020 analysis, only two websites made a clear and direct link to or mention of the animal research information. This represents a missed opportunity to promote the information as being an important element of the research responsibilities of these research-intensive Universities. This also speaks to the responsibilities as Concordat members as it represents an opportunity to meet commitment 3: "*We will be proactive in providing opportunities for the public to learn about animal research*". According to the results from the follow-up survey with the institutional contacts, all of the participants considered this to be something that should be utilised, yet this appears to be something that has not yet been implemented.

Another important aspect is the level of links provided by the University webpages to other resources. This speaks to not only providing the necessary information, but also promoting learning from different resources. Whilst most webpages made mention of the Concordat in some capacity, less than half (46%) provided a link to the Concordat itself, and none were found to link to the latest Concordat report. This again represents a missed opportunity to promote the Concordat that these institutions are a part of and further the values of transparency and openness.

5.1.2 Quality of the Online Information

When examining the quality of the information provided, the number of named members of research staff has remained pretty consistent between the two years. The most recent analysis in 2020 recorded eight institutions that named researchers compared to seven in the previous year. This was within the expected range as there still appears to be hesitation surrounding being publicly associated with this type of research, especially amongst researchers who had received training when antivivisection activity was high, as highlighted in a response to the institutional follow-up survey. This is also demonstrated in the publishing of AWERB meeting dates and minutes. The number of webpages that contained the dates of AWERB meetings and/or the minutes from such meetings is still quite low with seven institutions publishing dates and only five producing their minutes. In all cases, the published minutes were anonymised, which carries on the general theme of not directly naming researchers (Festing and Wilkinson, 2007).

There were four institutions that were found not to have published statistics on the number of animals used in research. This represented a fairly basic commitment to transparency and was disappointing to see. However, 85% of the webpages did meet this requirement. This speaks directly to commitment 1 of the Concordat *"We will be clear about how, when and why we use animals in research"* and is an integral part of the transparency agenda. As an extension to this, the analysis criteria also looked for these usage statistics to be contextualised by also including UK-wide animal usage statistics (Home Office, 2021). The idea behind this was that publishing numbers out of context, whilst a useful piece of data in its own right, might not present a clear picture in the minds of a lay person as to the scope of usage at that institution.

Generally, the vast majority of the webpages contained the basic information points such as an explanation of the licencing required for research, ASPA, the 3Rs and the ARRIVE guidelines. However, some webpages still miss these key points which consider the current emphasis on ethical responsibility of institutions to open science (Moravcsik, 2019) as well as the Concordat commitment; this is disappointing.

5.1.3 Role of Sentience and transparency

The second group of research questions aimed to establish if animal sentience knowledge plays a part in the transparency agenda. If institutions felt that sentience was important to the process, then it might be logical to assume they would want to refer to this on their webpages.

There was however, only one mention of sentience anywhere across all 26 institutions of the examined webpages. In the institutional online survey, two of the three responses indicated that they felt there should be a mention of animal sentience on the webpages. This does not appear to be the case in practice, however, instead, there often appeared to be a more round-about way of implying sentience as *"the word sentience is not always specifically used."* One response to the survey also suggested that the inclusion of a mention of sentience would

"negatively impact on the message to justify research", as it could *"risk informing the public that animals are less sentient that they think"* [IR1]. This may be a concern, but it could also be argued that there is value and potentially an ethical responsibility in an acknowledgement of the sentience levels of animals used in research alongside an explanation of how this is reflected in practice in the form of welfare standards and enrichment provided.

It is important to reflect on the differences between the two years in order to address potential validity concerns. The analysis of the websites was conducted by a single researcher at two instances a year apart. The criteria were designed in such a way as to minimise the impact that this time gap would have. The criteria looked for the presence or absence of information on the webpage and generally left little room for interpretation. This therefore should mean that anyone given the same criteria should be able to reach the same results when examining the webpages. The differences between the years may be due to one of three possibilities:

(1) The webpages had been changed or updated during the year resulting in the difference in assessment of the same criteria.
(2) The researcher incorrectly assessed some of the criteria in one of the years, resulting in a discrepancy when compared to the other year.
(3) The researcher changed their interpretation of what did and did not need to be present on the webpage in order to meet the criteria.

Reflecting on these issues, if the webpages had indeed been updated since the first assessment, then the differences are due to external factors and do not raise concern for the methodology of this study. In fact, if this is the case, it reflects positively on the institutions for being up to date on their published animal research information. However, if this is not the case, then there would have been an error somewhere in the process. The results from the first year were independently verified by another researcher who used the criteria to assess a random sample of institution webpages. The results garnered from this assessment matched the original results and supported the validity of the methodology. In order to provide additional reassurance, additional rechecking was implemented in the instances presented in the table where information had gone from marked being present the previous year to not present in the following year ("Yes to No"). As mentioned previously, the criteria are generally designed to leave little room for researcher interpretation. Thus, in most cases this should have minimised the effects, however there is still some level of interpretation required for a few of the criteria, with some of the wording perhaps not being as tight as it could have been.

It seems from the analysis that the basics of the transparency agenda are largely being met. Each institution that was examined did have a functioning webpage that was for the most part accessible from the links provided, or at least required minimal additional effort to find, and each of these webpages provided some level of information on animal research. It was disappointing to see that some webpages however still lacked basic information such as the 3Rs or ASPA which represent some of the core knowledge in this field. These findings speak to the first research question of this study and paints a picture of how institutions are

delivering on their transparency responsibilities. There are vast differences in the lengths taken to meet and exceed these responsibilities, and in many areas, there is still room for improvement. The next section expands upon the topics discussed in this analysis and discuss the themes that emerged from the online surveys.

5.2 Institutions and Researchers Reflections on Key Concepts

Examining the way in which values may be operationalised by institutions and how they visualise their responses and current provisions is an important aspect of examining how the transparency agenda is framed and how important ethical concepts such as animal sentience are constructed. The surveys provided an opportunity to examine what the institution representatives felt should be put into practice. The surveys also offered participants the chance to discuss the ideas of sentience and culture of care in the context of transparency. This section discusses both surveys together due to the need to draw out any linkages between overarching themes of transparency, sentience, and culture of care, before drawing together these themes and offering some reflections and suggestions for improvement.

Due to the restrains of this research project, the follow-up institutional survey was open for ten working days. The contacts at the institutions therefore had this amount of time to respond. Out of the 15 participants invited, three responded. This means that for this section of the research, there is a limited data pool. This warrants further research in the future. It was considered as an alternate methodology, to use Freedom of Information requests to obtain information to supplement this survey, as this type of approach has been used by UK researchers to obtain information when a topic is controversial, or organisations are reluctant to respondent to information requests (Savage and Hyde, 2014). This was decided against however, as it was felt the information obtained via this route would be of a lower quality due to the restrictions imposed by the request process. The surveys allowed for more directed questioning and more open and honest responses to the questions. It also seemed more fitting as a measure of the openness and transparency agenda.

Similarly, the original methodology planned for use for this study included the use of semi-structured face to face interviews. These could have provided a greater opportunity for participants to elaborate on the issues raised in the online questionnaire but would also have been more time consuming. The choice to adapt this to an online survey rather than these in person interviews was done due the restrictions during the COVID-19 pandemic. Future studies using interviews could yield interesting data not identified in this research.

With that said, useful data was collected, and reflections can be drawn from these limited number of survey responses, especially in relation to any disparity between views and their practical implementation through the public website provisions. A common response to questions regarding how effectively webpages were delivering their transparency responsibilities, was the acknowledgement that more work needs to be done, and that updates were to occur soon. From the website analysis, this reflection matches the findings of the public facing website analysis. The findings appear to show a genuine interest in seeing improvements, as the

respondents stressed the importance of the public being informed about their animal work.

The links between animal sentience knowledge and approaches of the institutions seemed to vary. The responses indicated that sentience could play a part in the decision-making processes behind welfare policy and animal care but seemed to have less of an influence over the approach to openness and transparency, as it was mentioned much less in those contexts. As mentioned previously, the responses indicated that there was a reluctance to mention sentience on the grounds of negatively impacting on public opinion. Still, one of the participants felt they were currently not producing a satisfactory level of information regarding animal sentience on their webpage. There appears to be different approaches to operationalisation of their ethical responsibilities to transparency.

The second online survey conducted with the VetBioNet research community had a larger sample size, so that dataset presents opportunities to explore issues in more detail. However, similar themes arose between the two surveys indicating that there is at least some continuity between researcher's constructions of responsibilities and priorities at an institutional level. This is further supported by the responses provided in the survey, as the vast majority of responses indicated that they felt their own ethics were in line with their institution's ethics policies.

5.2.1 Conceptualising Transparency

Throughout the thematic analysis of the surveys, key themes and common concepts were identified with a number of prevalent aspects across the responses from multiple streams of data collection.

A key theme that emerged was the problems associated with reporting information of this nature. Many of the participants expressed that they felt inadequately skilled to communicate this information in an effective way. This, combined with a fear of generating a negative reaction if done incorrectly, seems to have led to a hesitation surrounding publishing research. Some suggested that this situation could be rectified through the use of dedicated science communication teams and specialists that are primarily responsible for meeting transparency commitments as part of the openness agenda. Whether or not this approach is best, compared to providing training and encouragement for researchers to get involved in the communication of animal research information, is something which should be considered in more detail by institutions.

The reporting challenges combined with a general lack of focus surrounding what information exactly should be published seems to result in many feeling unqualified to discuss certain topics in the public forum.

5.2.2 Constructing Sentience

Exploring the construction of sentience and the connection of this concept to practice within research institutes is an important issue. The survey participants were asked to define sentience and consider which animals they considered to be sentient. These questions facilitated the examination of what constructions of sentience, previously discussed in the literature review, are being used by the researchers in their work. This is important as personal and institutional

constructions of these terms can affect intention and the practices that operationalise the values expressed in these constructions (Proctor 2012; Duncan, 2006). When analysing the responses, two notable themes arose, with some responses focused largely on the capacity to "feel" and some focused on the capacity to "suffer".

When respondents constructed sentience through the capacity to feel, although the definitions of sentience varied, many of the definitions involved this capacity to feel subjective emotional states, such as happiness or fear. These responses tended to lean towards a construction of sentience that was focused more on emotional responses. This is perhaps the most difficult of the constructions to objectively measure, due the individual nature of subjective experiences, and is the most susceptible to the influence of anthropomorphism but appears to be influential for the research community none the less.

When constructing sentience through the capacity to suffer, in many of the responses, the capacity to feel these kinds of emotional states was also paired with the capacity to feel pain or suffer. This theme was widely expressed, and alongside responses that tended towards a construction of sentience, focused on physical structures and capabilities. When asked to describe the animals considered to be sentient, the majority of respondents drew the line at vertebrates. This seems consistent with this focus on physical structures, and the implication that a central nervous system is a requirement for sentience, that is seen in current literature on the subject, for example see Proctor (2013) or Duncan (2006).

However, as previously argued in the literature, it may not be the best approach to concentrate on pain and suffering as a focal point of the hunt for sentience as it can lead to challenging ethical dilemmas. Therefore, more work needs to be done to raise awareness of the different interpretations as a starting point. It could also prove useful to establish an agreed upon standard definition within the community to improve translatability.

Some of the respondents were unfamiliar with some of the terms used in research. The research community approached is international, and it was interesting to consider some of the translatability of some of these concepts. As said by one of the respondents, there may be *"similar but not identical"* words used that convey these ideas, or there may be less consideration given to these concepts in certain parts of the world. This could warrant further investigation and could provide an opportunity for an exchange of ideas in the interest of improving and harmonising animal related policy.

When considering the link between animal welfare and sentience, the most commonly noted improvement in practice was deemed to be the level of enrichment provided to the animals. The majority of the respondents said they were happy with the enrichment being provided at their institution. This seems to imply that an increased understanding of the level of sentience of animals involved in research has led in part to a greater appreciation of their welfare needs, with enrichment being an example.

When considering the limitations of improved sentience knowledge it was suggested that alongside these benefits, there was also a downside to this

increased level of sentience knowledge. One response expressing the view that societal demand for breeding conditions has changed without taking enough consideration of other stress this can bring. There were a number of suggestions for improvements in these areas put forward by the respondents. Researchers expressed the desire to have more opportunities to provide for their animals, such as fresh fruit and vegetables, and to improve their care through better waste disposal. The respondents also expressed concerns about the provision of enrichment, with increasing enrichment being seen as difficult to achieve in certain situations due to the nature of the research environment where biosecurity is of the upmost importance.

5.2.3 Culture of care

Understanding the nature of an individuals' or institutions' construction of a culture of care in an animal research setting is difficult to achieve but a number of interesting aspects emerged from the survey responses. All of the respondents indicated that there was a culture of care implemented at their institutions but there was little in the way of details provided about this in their responses or on their webpages. It was not however specifically examined in the criteria of mapping online provision research and could be something that could warrant future research as part of the transparency agenda. The transparency link was recognised by one of the respondents when they insisted that ensuring that the public are informed of the scientific output is embedded within the definition of a good culture of care. The participants were asked to consider the driving factors behind culture of care, resulting in the identification of a number of themes.

When constructing culture of care in terms of animal welfare rather than sentience, the nature of a culture of care was deemed to be subjective and up for interpretation by individual institutions. The majority of the respondents indicated that they were satisfied with their institutions approach to culture of care. There appears to be little direct link between sentience understanding and culture of care. It however seems to influence the level of welfare and enrichment provided to animals, which form part a culture of care (Proctor, 2012; 2013; RSPCA, 2020). Many of the researchers when asked to define a culture of care, focused on animal welfare, and having an animals first approach, with one response mentioning the value of the animal.

When considering the differences in attitude to culture of care, there were a range of comments from the researchers that highlighted problems with implementing a culture of care at their institutions. Some expressed a concern that young staff had a much stronger interpretation of culture of care than older researchers and some commented that they felt there needed to be a better emphasis on preparation so each animal experiment can be used by several researchers. This perspective is also mirrored by those commenting on the 3Rs such as Lee et al (2020) and Fenwick et al (2009).

6 Conclusion

The animal experimentation debate has been prevalent for centuries and will continue until animal use is replaced in experimentation. At the time of this work, the role of medical research has been at the forefront of everyone's minds for the past 18 months, with the COVID-19 pandemic affecting people around the globe and the biomedical research work that has been conducted to develop a vaccine. The role that animal research has played in the development of vaccination programmes during this time may affect future considerations of animal use. There are already claims and counter claims about the role animal models have played in vaccine development and what role animal research should play in the future (Herrmann, 2019). Indeed, the UK Government has recently announced a review of the use of animal research in the country (Horton, 2021) and this announcement was published only just before news regarding direct-action by antivivisectionists against a dog breeding facility near Huntingdon in Cambridgeshire (Leishman, 2021). The first notable direct-action activity for a number of years.

With this backdrop, this study on transparency and the concepts of sentience and culture of care in animal research is timely. This research aimed to explore the impact of the increasing imperative for openness and transparency and our ever-growing understanding of animal sentience and its role in the culture of care in animal research.

Using the approach laid out in this report, this work has identified key-ways in which the concept of sentience has potentially influenced decision-making in the animal research industry and has identified what researchers perceive are areas for improvement in this regard. This research has identified that sentience seemingly has little direct impact on the transparency agenda, as almost none of the sampled 26 institutions mention the concept on their outwards facing animal research information. Similarly, there appears to be little direct engagement with the concept of sentience as part of their constructions of a culture of care. Instead, it seems that researchers' understanding of the sentience of animals seems to indirectly influence these concepts through an underlying idea of a responsibility to the animals. The welfare improvements claimed by the researchers, including improvements in enrichment provided to research animals, indicates an acknowledgement of the need to consider the animal to be capable of experiencing subjective emotional states and/or the capacity to suffer.

There still appears to be a lack of consensus regarding the precise definition of the word "sentience" and how it is constructed. Developing some common understanding and definitions could make it easier to have defined standards, perhaps on a species basis, to help to bring this important concept to practice and implement improvements in animals lived experience. This warrants future work as the wide array of constructions highlighted in this report require different degrees of legal protections for animals in order to be implemented. It would also help with translatability. This research has also highlighted a need for these concepts to be made more internationally available, as some of the participants from the wider EU community were not aware of some of the terms used in this

research, such as sentience and culture of care. This was not explored very deeply in this research and could warrant further investigation.

This report offers constructive recommendations for how to improve the implementation of the transparency agenda. Promoting animal research information on the main research page of university websites could present a great opportunity to encourage engagement from lay persons. The publishing of minutes from AWERB meetings is a valuable opportunity to present exactly what occurs at the regulatory level of animal research and should be encouraged. Greater engagement with the concept of sentience and the intrinsic value of the animals involved in research in the public forum is recommended. Previous studies have highlighted the dilemmas that researchers feel they face when discussing animal research (Holmberg and Ideland, 2012); as they strive to be open, there are concerns about risks which in turn creates a culture of secrecy and 'selective openness'. Previous studies on the issue of transparency were completed before the implementation of the Concordat and the analysis from this study indicates that there is reasonable compliance to the Concordat. When considering how transparency could be further fostered by the Concordat, this could be to extend the requirements to be more prescriptive. For example, detailed criteria such as those referred to by Varga et al (2010) on publication requirement could be part of a more specified transparency criteria. Taking Varga et al's (2010) suggestions, this could be full publication of the AWERB oversight and ASPA codes and setting up a database on these at the institutions.

However, the findings from this study indicate that it is not just within the transparency agenda that there is room for improvement. The participants involved in this research highlighted the need for improvements in animal welfare and culture of care across institutions. They wished to see more opportunities to provide animals with better food, technical improvements in waste disposal and changes to increase the translatability of optimal husbandry conditions to outcomes in field conditions.

Future research is warranted to expand on the approach and outcomes of this project and to further examine the barriers to change and wider improvements that can be made. This work could be taken further with additional empirical work through focus group discussions and interviews, as these methods may help to provide further details not found in the web-based survey methodology of this research.

Implementing the recommendations from this work will benefit the various stakeholders of the industry, the animals themselves and relations with the public. These recommendations represent small changes in what will continue to be a long path of process which should see gradual advancement and improvement in animal experimentation practice and policies.

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8 Appendix 1: Letter of Approach

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02 April 2020

Dear xxxxxx.

Assistance with MRES Bioethics research project

I am a current MRes student within the School of Biosciences, University of Nottingham. My project topic is **The Impacts of Sentience on Culture of Care.**

The project aims to explore scientists' views of animal sentience and culture of care in experimental animal use. These two aspects will be discussed in relation to current approaches and future plans relating to approaches to reporting and care standards set by EU animal research institutions. It is supervised by Prof. Kate Millar and Dr Michelle Hudson-Shore.

You are being invited to take part because you are actively involved in/ representative of research conducted using animals at your institution, which is a signatory of the UK Concordat on openness and transparency in animal research. You have been specifically chosen as a representative based on your prior or existing professional relationship to this project's supervisors. In total, are inviting approximately eight participants like you to take part.

Previous literature review has highlighted the vast gains in sentience related knowledge, yet very little has been done to study what this means in practical terms for animal research intensive institutions. The information your institution publishes on animal research has previously been subjected to analysis as part of this project. This, combined with the reviewed literature has generated the following themes I would like to discuss as part of an interview:

1. How sentience is defined and how it is constructed
2. How often researchers engage with the concept of sentience
3. How sentience affects both welfare and a wider culture of care
4. How sentience affects reporting of animal welfare and openness with the public

I plan to conduct these interviews during the next couple of months and would greatly appreciate your participation. The anonymity of respondents will be fully protected, and confidentiality maintained at all times. Careful editing will be undertaken before findings are released into the public domain and respondents' institutions will not be identified. All data will be securely stored and preserved

according to this University's Code of Research Conduct. This project has full ethical approval from the University of Nottingham's School of Sociology and Social Policy.

The interview should last approximately 45 minutes. In these times especially, I understand that you will be extremely busy but hope that we can plan for me to contact you via telephone or video conference call at a time that is convenient for you. I will contact you again in the next week or two to see if a meeting may be possible. Alternatively, or if you require any further information or clarification, please see my contact details below.

Yours sincerely,

Joshua Cantrell BSc (Hons)

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