# OVERCOMING AGGRESSION:

# MUSING ON MINDFULNESS AND SELF-CONTROL

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**ABSTRACT**

**Overcoming aggression: Musing on mindfulness and self-control**

The ability to restrain oneself from acting on aggressive impulses is arguably a crucial aspect of human functioning and interaction. Yet growing evidence in the literature suggests that people's self-control resources may be limited and, at times, self-controlled regulation could even increase the association between aggressive triggers and aggressive behaviour. As an alternative, mindfulness practices encourage individuals to be aware and accept their aggression-related thoughts and emotions simply as an ephemeral state rather than to control them.

Across four studies, we investigated the possibility that brief, as opposed to extensive, mindfulness exercise may reduce aggression, and whether this potential effect can be separated from a general mechanism of self-control. The relationships between mindfulness, self-control, and aggression were explored in their dispositional forms (Study 1; *N* = 241). Then, the effect of brief laboratory inductions of mindfulness was tested following manipulations designed to either bolster (Study 2; *N* = 99) or weaken (cross-cultural samples: Study 3; *N* = 119 vs. Study 4; *N* = 110) the resources of self-control. In addition, the potential roles of individual differences in sensitivity to provocations (SP) and frustrations (SF), and self-harm on aggression were also assessed.

Results indicated that (i) despite one's dispositional ability to exert self-control, the presence of a mindful quality uniquely reduced the experiences of anger and hostility, (ii) under the condition of full self-control resource (i.e., after self-control training), mindfulness induction contributed only in reducing more subtle/implicit forms of aggression, and (iii) under lack of self-control resource (i.e., following ego-depleting task), mindfulness induction significantly reduced direct physical aggression after the experience of provocation across cultures. The benefit of mindfulness on aggression appears to be more salient when individual's self-control resource has been taxed, which operates similarly in Western and non-Western settings. Therapeutic tools focusing on the mechanism for controlling the expression of aggression would benefit from an inclusion of mindfulness-based strategies, as well as an early identification of individual's sensitivity to different types of aggressive triggers and risks for self-harm.

***Keywords**:* mindfulness induction, self-control training, ego-depletion, aggressive behaviour, cross-cultural

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# CHAPTER ONE

# Background to the thesis and literature review

## 1.1 BACKGROUND TO THE THESIS

Aggressive behaviour can be problematic in a wide array of settings, including in school, workplace, mental health rehabilitation, and correctional facility. The latest figures from the Crime Survey for England and Wales (CSEW) estimate 2.1 million violent incidents in England and Wales in 2011/12, with 3% of adults victimised (Office for National Statistics, 2013). The CSEW figures are based on a representative sample survey of adults resident in households in England and Wales about the crimes they have experienced in the previous 12 months, including crimes that have not been reported to or recorded by the police.

In Western countries, various psychological interventions have been employed to predict and prevent aggression and violence. Throughout the past two decades, the majority of psychological treatments for offender populations were based on "second-wave" cognitive-behavioural approaches (Howells, Tennant, Day, & Elmer, 2010). Within these approaches, individuals are taught various strategies that enable them to make a deliberate attempt to control and modify their undesirable thoughts or emotions that may produce maladaptive behaviours.

### 1.1.1 Mindfulness and self-control

More recently, a group of meditational practices known as *mindfulness* techniques has been promoted as part of the application of "third-wave" cognitive-behavioural approaches for aggression (Howells, 2010; Wright, Day, & Howells, 2009). Third-wave approaches are strongly influenced by Eastern contemplative traditions, Buddhism in particular. Essentially, the goal of these approaches is to encourage individuals to observe and accept, rather than to exert control over their thoughts,

emotions, or behaviours (a thorough discussion on mindfulness, acceptance, and cognitive-behavioural tradition is provided in S. C. Hayes, Follett, & Linehan, 2004).

While debate over the precise definition of mindfulness continues, Western researchers commonly follow Bishop et al.'s (2004) operationalisation of mindfulness as two components of (i) sustained attention on the immediate experience, and (ii) an attitude of curiosity, openness, and acceptance towards one's experiences. Sustaining attention on uncomfortable experiences, without making any direct attempt to modify (e.g., avoid, suppress, ruminate on) them, is thought to increase one's *exposure* to these experiences, and should eventually lead to the *extinction* of any habitual associated responses (e.g., Baer, 2003; Linehan, Bohus, & Lynch, 2007; Shapiro, Carlson, Astin & Freedman, 2006). Arguably, mindfulness may reduce individual's emotional reactivity that is typically associated with aggression-triggering events.

Increasingly, the current literature has documented the application of mindfulness-based interventions for treatment of aggression in mental health and forensic settings. Despite encouraging evidence, significant methodological flaws, including lack of randomised-controlled trials, sole reliance on self-reported measures, and inconsistent definitions of mindfulness, have been identified (see Fix & Fix, 2013; Shonin, Gordon, Slade, & Griffiths, in press). Crucially, Masicampo and Baumeister (2007) have pointed out many similarities between features of mindfulness-based interventions and training in *self-control.* They maintain that the very reason for the various benefits of mindfulness interventions (e.g., physical health, mental health, behaviour regulation, emotion regulation, interpersonal relationships) because mindfulness training is, essentially, an example of self-control training. As a result, the distinct contribution of mindfulness *per se* has not been established.

The ability to control oneself is relevant to aggression because the inability to refrain from behaving aggressively is typically an undesirable response in modern societies. Indeed, an accumulating body of research has documented the link between self-control and aggression (Caspi, 2000; Gottfredson & Hirschi, 1990; Moffitt et al., 2011). If the benefits of mindfulness on aggression is *entirely* attributable to a

general mechanism of self-control, then being more mindful when encountering aggression-triggering events should not produce any additional reduction in aggression. However, as we will describe in the next section, mindfulness and self-control appear to be conceptually different. Consequently, it is feasible that the extent to which each approach may influence aggression may vary. To our knowledge, no published studies to date have particularly focus on any differential association between mindfulness, self-control, and aggression.

It is a key aim of the thesis, therefore, to identify whether and how the effect of mindfulness on aggression can be disentangled from the effect of self-control, particularly outside extensive training in mindfulness. For this purpose, we shall focus on aggression in general instead of the specific forms of aggression such as violence or sexual offending.

### 1.1.2 Cultural influences on mindfulness, self-control, and aggression

Cultures determine their own sets of values to which individuals are exposed. Individuals from different cultures may vary in their familiarity and acceptance of mindfulness and the application of mindfulness in daily life; whereas self-controlled regulation of personal goals and professional achievement is pervasive in Western cultures (Brown, Ryan, & Creswell, 2007a). In addition, tolerance towards different types of aggression may also vary across cultures. Previous cross-cultural studies (e.g., Bergeron & Schneider, 2005; Forbes, Zhang, Doroszewicz, & Haas, 2009; French, Jansen, & Pidada, 2002) have shown that individuals from a culture that emphasises maintaining social harmony (typically associated with Eastern and collectivist cultures) are less likely to resort to direct methods of aggression in response to provocation than those from individualistic cultures. These cultural characteristics may also moderate any influence of mindfulness, and self-control on aggressive behaviour. Examining the utility of the Western operationalisation of mindfulness amongst individuals from Eastern cultures is also important, considering the cross-cultural validation of this Western operationalisation is still lacking (Christopher, Charoensuk, Gilbert, Neary, & Pearce, 2009).

### 1.1.3 Role of individual differences

Individuals may vary not only in terms of their general propensity to aggress, but also in their sensitivity to different aggressive triggers. Lawrence (2006) have shown that individual differences in sensitivity to provocations (SP) and frustrations (SF) were associated to distinct components of aggression. Thus it is plausible that SP and SF may have different influence on the potential link between mindfulness, self-control, and aggression. To date, this possibility has not been examined in the literature.

It is also noteworthy that the potential link between mindfulness, self-control, and aggression is investigated in relation to individuals' tendency to harm themselves (self-harm). The literatures on aggression and self-harm are commonly separated. However, similar possible antecedents of these two harmful behaviours have been identified (e.g., Hillbrand, 2001; Placidi et al., 2001; Plutchick & van Praag, 1989; Roaldset, Bakken, & Bjørkly, 2011). This highlights the necessity for setting up more integrated risk assessments of aggression and self-harm. Even though mindfulness-based interventions have been widely applied for treatment of self-harming behaviour (Linehan, 1993; Segal, Williams, & Teasdale, 2012), the potential and relative benefits of mindfulness and self-control on self-harm have rarely been investigated in a single study (for an overview, see Slee, 2008).

### 1.1.4 Aims of the thesis

The main purposes of this thesis are to investigate the role of mindfulness on aggression, and to elaborate whether and when this potential effect can be separated from a general mechanism of self-control. In particular, the thesis aims to do the following:

1. Examine the extent to which the benefits of mindfulness on aggression may occur outside extensive training in mindfulness.
2. Directly compare the benefits of mindfulness and self-control on aggression.
3. Assess the validation of Western operationalisation of mindfulness, and self-control, on aggression.

4. Investigate any similarities between the mechanisms of aggression and self-harm regarding mindfulness and self-control and individual differences.

As a whole, the thesis aims to provide a useful framework on whether and when mindfulness and self-control could be incorporated in the intervention strategies for the reduction of aggression and self-harm. The information that can be obtained from this investigation may potentially contribute both clinically and practically.

## 1.2 LITERATURE REVIEW

In this section, we will first outline the conceptualisation of aggression and aggression-related constructs. Then we will review the potential role of mindfulness in the reduction of aggression. Our focus will then turn to current evidences for the effect of self-control on aggression, with a particular focus on the strength model of self-control. Finally, we will suggest a framework to support our proposal that mindfulness may influence aggression in the same way it is proposed to be influenced by self-control, but that the effect of mindfulness may even be independent of and beyond the effect of self-control.

### 1.2.1 Conceptualisation of aggression and aggression-related constructs

#### 1.2.1.1 Definition and types of aggression

Human aggression has been traditionally dichotomised into (i) hostile aggression, which refers to impulsive, reactive behaviour driven by anger, motivated by a desire of harming the target, and (ii) instrumental aggression, which refers to premeditated, proactive behaviour motivated by goals other than harming the target (e.g., B. A. Baron & Richardson, 1994; Berkowitz, 1993; Geen, 2001). However, this view has failed to consider that aggressive acts may be motivated by many different goals (for a comprehensive argument, see Bushman & Anderson, 2001).

To allow a discussion between hostile and instrumental aggression, Bushman and Anderson (2001) define *aggression* as any behaviours directed towards another individual with the *proximate/immediate intent* to cause harm to the target, whereas the target is motivated to avoid the behaviour (a similar definition is provided in B. A. Baron & Richardson 1994; Berkowitz, 1993; Geen, 2001). While the presence of intention to harm others is necessary as a proximate goal, different acts of aggression may vary in terms of their ultimate goals. For instance, robbery and physical assault are classified as aggression since both conducts include intention to harm the target at a proximate level; although ultimately robbery also serves profit-based goals and assault serves harm-based goals (Anderson & Bushman, 2002).

Bushman and Anderson's definition of aggression can be clearly seen when the perpetrator directly inflicts harm on a target, either physically (e.g., hitting another person) or verbally (e.g., yelling at someone), in a face-to-face situation or where the perpetrator is easily identified. Human beings, however, are capable of inflicting harm through concealed acts, such as damaging the reputation, gossiping, or socially excluding others. This type of aggression is defined by Björkqvist and colleagues (Björkqvist, 1994; Björkqvist, Lagerspetz, & Kaukianen, 1992) as *indirect aggression*; due to its circuitous and anonymous delivery of harm. Much like direct aggression, indirect aggression can be either physical (e.g., hiring an assassin) or verbal (e.g., spreading rumour). In an integrated review, Archer and Coyne (2005) conclude that indirect aggression is essentially the same form of aggression with other constructs labelled as relational aggression (Crick & Grotpeter, 1995) and social aggression (Cairns, Cairns, Neckerman, Ferguson, & Gariepy, 1989), in which the perpetrator's intention is to socially exclude, or harm the social status of the target.

This thesis employs the definition of aggression as a *behavioural process* of harming the target who is motivated to avoid the act, and may be carried out through a direct or indirect route, either physically or verbally. Thus aggression excludes behaviour in the absence of any intention to harm (e.g., accidentally stepping on someone's foot), behaviour where the target is not motivated to avoid (e.g., suicidal behaviour, sexual masochism), as well as prosocial acts that happen to cause harm to the target (e.g., a surgeon causing pain to her patient during surgery).

#### 1.2.1.2 Aggression-related constructs

The criterion problem in aggression research often occurs since the terms aggressive behaviour, anger, and hostility have been used interchangeably (Parrot & Giancola, 2007). Although anger is a common antecedent of aggression, it does not always lead to aggressive behaviour. Most individuals report experiencing mild to moderate levels of anger from several times per day to several times per week, but they usually do not act upon it (Averill, 1983). As defined by Berkowitz (1993), anger is an *emotional* response to an event or situation that lacks of a *specific* behavioural goal, whereas hostility is a *cognitive* construct that involves negative interpretations and thoughts about the environment.

In a similar vein, Buss and Perry (1992) define (i) anger as the emotional or affective component of aggression that involves physiological arousal and preparation for aggression, and (ii) hostility as the cognitive component of aggression which consists of feelings of ill-will and injustice. They suggest that because anger is a high-arousal state that diminishes over time, dissipation of anger may cause a cognitive residual of hostility. Both anger and hostility, in combination with *physical and verbal aggression* which represent the instrumental, motor, or overt component of behaviour, are subsumed under the *general trait of aggression* (Buss & Perry, 1992).

D. B. O'Connor, Archer, and Wu (2001) demonstrated that trait aggression was related to aggressive response to provoking scenario (as measured using a vignette-based approach), and that aggressive response was related to aggressive feelings (i.e., anger, frustration, and irritation). This indicates that trait aggression may set up a basis for individuals' preparedness to behave aggressively when encountering situational triggers of aggression. As shown in the General Aggression Model (GAM: Anderson & Bushman, 2002), the person-based (*who*) and situation-based (*when*) predictors of aggression would influence the production of an aggressive or nonaggressive behaviour (*why*) through their influence on the *present internal states* (i.e., cognition, affect, and arousal routes) that determine the underlying appraisal and decision processes.

Lawrence and colleagues (Lawrence, 2006; Lawrence & Hodgkins, 2009; Lawrence & Hutchinson 2013b) have further developed a distinction between provocations (i.e., goading and instigation from others) and frustrations (i.e., situations where the individual experiences a lack of control due to circumstances or the behaviour of others) as two independent triggers of aggression. Their initial study showed that individuals vary in the extent to which they were sensitive to these two aggressive triggers; and that sensitivity to provocations (SP) was related to self-reported overt aggression, whereas sensitivity to frustrations (SF) was related to hostility and anger (Lawrence, 2006). Individuals' differences in SP, but not in SF, also predicted *aggressive interpretations* of provoking individuals beyond trait aggression and mood (Lawrence & Hodgkins, 2009) and *aggressive behaviour* under provoking situation after accounting for trait aggression and participants' sex (Lawrence & Hutchinson, 2013b).

Individual differences in SP and SF, as well as in the general propensity to aggress, may differentially influence the extent to which individuals are more likely to behave aggressively under different aggressive triggers. As this thesis examines aggressive behaviour in response to provoked and unprovoked aggression, it is necessary to account for the potential influences of SP, SF, and trait aggression on the link between mindfulness, self-control, and aggression.

Further, the current literature has also documented similar antecedents for aggression and self-harm, including lower levels of serotonin (Barbui et al., 2009; Roaldset et al., 2011), cerebrospinal fluid monoamine metabolite (Placidi et al., 2001), greater experience of hopelessness and higher levels of impulsivity (Plutchick & van Praag, 1989), and severe lack of behavioural control (Hilbrand, 2001). This indicates that individuals' propensity to cause harm to others may also be related to their tendency to harm themselves.

Gratz (2001) defines "deliberate self-harm" as the deliberate, direct destruction or alteration of body tissue *without conscious suicidal intent*, but resulting in injury severe enough for tissue damage (e.g., scarring) to occur. A similar definition is referred by Favazza (1996, 2012) and Nock (2010) as *non-suicidal self-injury.* With

this definition, a distinction is made between self-harming behaviours that are suicidal and non-suicidal in nature. In this thesis, we ask participants to complete Gratz's (2001) measure of deliberate self-harm, which was designed to specifically assess self-harm in the *absence* of suicidal intent.

More recently, however, the prefix "deliberate" is no longer preferred by the National Collaborating Centre for Mental Health (NCCMH, 2012) because it is considered judgemental, and the intentional aspect of self-harm is not always clear. Indeed, the presence/absence of suicidal intent may be unclear even to the individuals who harm themselves; and repetition of self-harm, regardless of the intention, is a risk factor for suicide (see Kapur, Cooper, R. C. O'Connor, & Hawton, 2013). Following the NCCCMH's recommendation, we use the term *self-harm* to allow a discussion about this behaviour regardless the underlying motivation. Self-harm also connotes other similar constructs such as self-injury, self-mutilation, self-poisoning, and self-aggression that have been used interchangeably in the literature.

The examination of the relationship between mindfulness, self-control, aggression and self-harm in this thesis is conducted, in order to explore the extent to which mindfulness and self-control influence self-harm in the same way as they influence aggression. Self-harm is also examined due to its potential influence on the link between mindfulness, self-control, and aggression.

In the following section, the original conceptualisation and recent Western operationalisation of mindfulness will be presented. Then the current empirical findings for the benefits of mindfulness on various psychological and physical functioning will be highlighted, followed by preliminary evidences for potential role of mindfulness in the reduction of aggression.

### 1.2.2 Mindfulness and its impact on aggression

#### 1.2.2.1 Conceptualisation of mindfulness

The concept of mindfulness originates from Eastern contemplative practices, specifically the Buddhist tradition of mindfulness meditation. The term "mindfulness" is translated from the Pali word (the language in which the early Buddhist teaching was recorded), *sati*, which literally means "memory", and closely linked to the verb, *sarati*, which means "to remember". The word *sati* also connotes attention (Shapiro & Carlson, 2009), and relates frequently with another Pali word, *sampajanna,* which means awareness or clear comprehension (Dryden & Steele, 2006; Vago & Silbersweig, 2012). Thus mindfulness does not refer to remembering to memory of past events, but to remembering to pay attention to and be aware of all that is taking place in the present moment (e.g., Siegel, Germer, & Olendzki, 2009; Wallace & Bodhi, 2006).

Over the last two decades, Western mental health professionals and researchers have extensively incorporated mindfulness meditation independent of any religious system, mainly as a therapeutic intervention technique. The mental qualities beyond *sati,* such as nonjudgment and acceptance, are typically included in the contemporary conceptualisation of mindfulness (Bishop et al., 2004; Siegel et al., 2009). This corroborates with one of the most often cited Western definitions of mindfulness as awareness that arises through "paying attention in a particular way: on purpose, in the present moment, and nonjudgementally" (Kabat-Zinn, 1994, p.4).

#### 1.2.2.2 Operational definition of mindfulness

Given the richness of the tradition from where mindfulness originates, Western researchers have continuously worked to develop an empirically-based operational definition of mindfulness, primarily validated through means of self-reported measures. The prevailing view appears to follow Bishop et al.'s (2004) definition of *two-component* model, in which mindfulness consists of (i) self-regulation of attention, and (ii) adoption of a particular orientation towards one's experiences.

Self-regulation of attention refers to nonelaborative awareness of thoughts, emotions, or body sensations as they arise in the present moment. Orientation to experience is characterised by attitude of curiosity, openness, and acceptance. Acceptance in this context is not passivity or resignation, but an active process of nonjudgmental *exposure* to the "in-the-moment" experience (Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008; S. C. Hayes, 2004).

Bishop and colleagues asserted that mindfulness is a *mode* of awareness cultivated when attention is regulated in the manner described, emphasising its state-like quality. State of mindfulness can be observed immediately through brief mindfulness interventions (Brown & Cordon, 2009), and may be converted into a stable tendency if practiced over a period of time (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Chambers, Gullone, & Allen, 2009).

On the other hand, the most prominently used mindfulness scale to date, the Mindful Awareness Attention Scale (MAAS) is based on Brown and Ryan's (2003) operationalisation of mindfulness as a *unidimensional* construct of receptive attention to and awareness of on-going events and experience in daily life. An accumulative body of research has found a great variation of the MAAS score amongst non-meditating and untrained individuals, underlining an inherent human capacity of mindfulness (Brown & Ryan, 2003; Brown, Ryan, Loverich, Biegel, & West, 2011; see also Kabat-Zinn, 2003). When described as a trait, the "acceptance" quality of mindfulness is seen as a prerequisite element for being fully engaged with the present experience (an extensive argument is provided in Brown & Ryan, 2004).

Although currently speculative, Holzel et al. (2011) and Sauer et al. (2013) suggest that whether acceptance is an independent component or a prerequisite for mindfulness may be attributable to the degree of meditation expertise. Specifically, in the normal states of mind, emotional reactions occur automatically. To be able to sustain attention on the present moment, a novice practitioner might need to exert cognitive control over the emotional reactions. With increasing mindfulness practice, one may have automated an accepting attitude, thus attention can be sustained in

an effortless way (for a recent review on the functional neural mechanisms of mindfulness, see Chiesa, Serretti, & Jakobsen, 2013).

For the purpose of this thesis, we follow Brown and Ryan's conceptualisation when describing mindfulness as a relatively stable individual dispositional, and assess the Bishop et al.'s components of mindfulness when examining the state aspect of mindfulness. While these authors' conceptualisations are not identical, they both imply that *sustained attention* represents the element most central to mindfulness.

#### 1.2.2.3 Benefits of mindfulness

Empirical research on mindfulness has been conducted through (i) clinical interventions, to examine the effect of mindfulness training on psychological and physical functioning, (ii) correlational studies, to examine the relations between individual differences in mindfulness and other constructs, and (iii) laboratory study, to test the immediate effects of brief mindfulness inductions. Although attentional control in emotion regulation literature is typically seen as adaptive when attention is directed away from emotionally provocative stimuli, mindfulness encourages individuals to bring attention back to the stimulus (Holzel et al., 2011).

A number of mindfulness-based clinical interventions, namely Mindfulness-Based Stress Reduction (MBSR: Kabat-Zinn, 1990), Mindfulness-Based Cognitive Therapy (MBCT: Segal et al., 2012), Acceptance and Commitment Therapy (ACT: S. C. Hayes, Strosahl, & Wilson, 2011), Dialectical Behaviour Therapy (DBT: Linehan, 1993), and Relapse Prevention (RP: Bowen, Chawla, & Marlatt, 2010) have been applied in treating a broad range disorders, including pain, stress, anxiety, depressive relapse, and eating disorders, as well as in improving overall mental health and well-being. Since 2009, the MBCT has been recommended by the National Institute for Health and Clinical Excellence (NICE) in the UK as an effective programme for preventing depressive relapse. Indeed, the strongest clinical effect sizes of mindfulness have been reported for the direct treatment of anxiety and/or mood-spectrum disorders (Shonin, Gordon, & Griffiths, 2013). Even eight weeks of mindfulness practice may

change the way emotion is processed in the brain (Williams, 2010). However, mindfulness-based interventions have been criticised for not consistently examining the relative contribution of mindfulness independently of other behaviour change strategies (for a review, see e.g., Baer, 2003; Chiesa & Malinowski, 2011; Davis & J. A. Hayes, 2011).

The inclusion of self-reported measures and laboratory studies of mindfulness may allow researcher to scrutinise the nature of mindfulness through its associations and influences on other related variables. Accordingly, in a current review on the effect of mindfulness, Keng, Smoski, and Robins (2011) have outlined associations between trait mindfulness with a host of indicators of psychological health, such as higher levels of positive affect, sense of autonomy, vitality, and adaptive emotion regulation, and lower levels of negative affect, rumination, cognitive reactivity, and general psychological symptoms, as well as differences in brain activity observed using functional neuroimaging methods.

Keng et al. have also concluded the effect of brief laboratory mindfulness inductions on various emotion-related processes, such as recovery from dysphoric mood, emotional reactivity to aversive or emotionally provocative stimuli, and willingness to return to or persist on an unpleasant task. These findings suggest that brief mindfulness inductions may work in a similar way as mindfulness training given over a longer period. Hence, some benefits of mindfulness may possibly be measured immediately in the absence of extensive prior training in mindfulness.

#### 1.2.2.4 Mindfulness and aggression

As a result of the benefits of mindfulness on reducing negative emotions, it is reasonable to expect mindfulness to attenuate the associations between aggressive triggers and aggression-related emotions, such as anger. Since aggressive emotions, thoughts, and behavioural tendencies are linked together in memory (see cognitive neoassociation theories, e.g., Berkowitz, 1989, 1990, 1993), mindfulness may even limit the activation of this link in the first place.

Current applications of mindfulness in the area of aggression have focused on the effects of mindfulness-based interventions in mental health and forensic settings. According to Howells et al. (2010), the incorporation of mindfulness into pre-existing cognitive-behavioural frameworks is particularly advantageous in situations when the individual reacts too quickly to consciously change a thought or behaviour, when emotional responses overwhelm conscious control of behaviour, or when the individual is lack of introspective ability and self-awareness to apply the conventional cognitive-behavioural strategies. As such, the risk factors of aggression that potentially curable through mindfulness also include poor emotional self-regulation (e.g., impulsivity), in addition to problems of negative emotions (e.g., anger).

In correctional facility settings, mindfulness-based interventions have been reported to reduce self-reported hostility (Samuelson, Carmody, Kabat-Zinn, & Bratt, 2007), as well as physical interventions, seclusions, and incidences of self-aggression (Chilvers, Thomas, & Stanbury, 2011). In a series of case-study, Singh and colleagues demonstrated the efficacy of a mindfulness-based intervention as a self-management technique to control aggressive behaviour in individuals with mild intellectual deficit and mental illness (2003), conduct disorder (2007), and autism (2011). Specifically, these individuals were taught to focus their attention mindfully on the "soles of the feet" when encountering aggression-provoking thoughts, events, or situations, then to make a choice about how to react once the calmness and clarity of mind have been established. A randomised controlled trial effect of the *Soles of the Feet* technique was recently reported for reducing verbal and physical aggression in individuals with mild intelectual disability (Singh et al., 2013).

Correlational studies of mindfulness have also supported associations between individuals' tendency to be mindful and their propensity to aggress. In the development study of the MAAS, Brown and Ryan (2003) found that trait mindfulness was negatively related to self-reported anger and hostility amongst breast and prostate cancer patients. Studies in samples of general population (Borders, Earleywine & Jajodia, 2010) and undergraduates (Kelly & Lambert, 2012) also found negative associations between trait mindfulness and self-reported anger, hostility, verbal aggression, and physical aggression. In addition to reporting lower

general disposition of aggressiveness, mindful individuals interpreted ambiguous social information as being less hostile (Heppner et al., 2008; Kelly & Lambert, 2012).

An exploratory attempt to investigate the effect of mindfulness in laboratory setting was conducted by Barnes, Brown, Krusemark, Campbell, and Rogge (2007). In their study, sixty heterosexual couples were asked to discuss their about relationship conflict topics, and their cognitive, emotional, and behavioural responses were examined. Following a conflict discussion, individuals with higher levels of trait mindfulness reported less anger-hostility towards their romantic partners. This relationship was mediated by individual's level of anger-hostility *before* the conflict discussion. Moreover, higher state mindfulness, but not trait mindfulness, predicted a better video-coded communication quality, including less verbal aggression (i.e., hostile and aggressive remarks directed towards the partner) and negativity and conflict (i.e., display of tension, irritation, anger), and marginally predicted less withdrawal (i.e., avoiding the interaction or discussion).

It should be noted, however, that Barnes et al.'s study did not actively induce participants' level of mindfulness. Instead, participants were asked to rate how mindful they were during the induction of conflict. Still, their study revealed that the potential effect of mindfulness on *expressed* aggression, in addition to its more typical effect on aggression-related emotions (i.e., anger) and cognitions (i.e., hostility), may occur outside the context of extensive training in mindfulness.

To our knowledge, the only reported aggression study to date that actively manipulated participants' state of mindfulness was conducted by Heppner et al. (2008). Specifically, a total of sixty undergraduates were randomly assigned to one of three conditions in a social rejection task: acceptance from partner, rejection by partner, or mindfulness plus rejection. A state of mindfulness was induced before the rejection feedback, using a 5-min task involving eating raisins while being focused in a mindful way on the experience of eating the raisin from Kabat-Zinn (1990). As predicted, in the subsequent aggression task with the administration of aversive noise blast, those in the mindfulness plus rejection condition showed less aggressive behaviour than those in the rejection only condition, and their behaviour

did not differ from that of those in the non-rejection condition. The promising results from Heppner et al.'s study indicated that provoked aggressive behaviour may be reduced through a brief mindfulness induction. However, they did not include any manipulation checks to confirm engagement in the mindfulness activity, and did not provide information with regards to participants' prior meditation experience.

Crucially, it is questionable whether the benefits of mindfulness can be separated from people's capacity of self-control (Masicampo & Baumeister, 2007). Review on the role of self-control on aggression will be presented in the next section, followed by our proposal for testing mindfulness in tandem with self-control on aggression.

### 1.2.3 Self-control and its impact on aggression

#### 1.2.3.1 Definition and ingredients of self-control

Baumeister (1998, 2011) proposed that the "self" can be organised based on three basic experiences. First, the self is a knowledge structure (a knower and a known), which develops based on the experience of reflexive awareness of self (e.g., self-esteem, self-perception, self-consciousness, self-monitoring, self-focused attention, self-reflectiveness). Second, self is an interpersonal being (a belonger), which involves interpersonal processes (e.g., self-presentation). Third, self is an agent with an executive function (a doer), which makes choices and decisions, exerts control over the environment, and *regulates its own responses*.

The capacity of the self to regulate itself by altering or overriding its dominant response tendencies is known as *self-control* (Bandura, 1989; Baumeister, Heatherton & Tice, 1994; Carver & Scheier, 1982, 2011). Because self-control involves restraining impulses, researchers often treat the measures of self-control as though they are equivalent with impulsivity; however, these are two independent constructs (Duckworth & Kern, 2011).

The term self-control has also been used interchangeably with self-regulation, self-discipline, willpower, effortful control, ego strength, and inhibitory control

(Duckworth & Kern, 2011). To avoid terminological confusion, it has been suggested to allocate self-control as the deliberate, conscious, effortful subset of self-regulation (Baumeister, Vohs, & Tice, 2007). As we have previously discussed (see section 1.2.2.2), mindfulness can also be seen as a conscious "subset" of self-regulation, but a less effortful one. In this thesis, we use the terms self-controlled regulation and mindful regulation whenever it is necessary to contrast these constructs.

According to the influential theory of *feedback loops* (Carver & Scheier, 1982, 2011), originally developed by cybernetics theorists, self-control is a regulatory cycle consisting of a sequence of four steps, under the acronym of TOTE (test–operate–test–exit). In the testing phase, people are comparing the self or aspect of the self against a reference value or standard of comparison (the so-called self-awareness). Some operations to change the self can be initiated if a discrepancy between the desired and current states is detected. Further tests are then performed to evaluate whether the self has now been brought into line with the standard. When no further operations are required to eliminate or reduce the discrepancy, the self-control process enters the exit phase. During the testing phases, aversive emotions typically arise when the self is below the relevant standard, whereas positive emotions occur if the self has surpassed the standard (Baumeister, Schmeichel, & Vohs, 2007).

As the feedback loop theory implies, effective self-control consists of reducing the discrepancy between the desired and current states. To do so, the desired states must be set against a clear and well-defined *standard.* The standard can be some ideals, values, morals, social expectations, or long-term personal goals. Apart from standards, effective self-control requires *monitoring* (continuously observing one's current states or performance against the desirable goals or standards), the *capacity of the self to make changes,* and *motivation* (Baumeister, Schmeichel, et al., 2007).

This thesis focuses on two ingredients of self-control: monitoring and the capacity of the self. As we will argue in the latter section, the monitoring process, which corresponds to the "Testing" phase in the TOTE theory, can be enhanced through mindfulness. This may contribute to a more effective regulation of aggression.

#### 1.2.3.2 Strength model of self-control

Given that research on self-control has focused on people's effort to stimulate desirable responses and inhibit undesirable responses, it is not surprising that body of evidence has linked good self-control to a variety of benefits. Amongst these benefits include healthier interpersonal relationship, greater popularity, better mental health, effective coping skills, superior academic performance, as well as less vulnerability to drug and alcohol abuse, aggression, criminality, and eating disorders (see de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012; Moffitt et al., 2011). However, exerting self-control is not without cost.

In considering the costs of self-control, it is relevant to differentiate between its trait and state aspects. Trait self-control is a broad, dispositional tendency to exert self-control; the state is a current propensity to exert self-control. While trait self-control appears to be a highly desirable quality, the momentary act of self-control seems to require significant sacrifices (for an overview, see Baumeister & Alquist, 2009).

According to Baumeister et al. (1994), much like a muscle, the capacity of the self to change itself relies on the availability of a common and limited pool of self-control "resources", or *self-control strength*. The construct of self-control strength corresponds to the "Operate" phase in the TOTE theory (Bauen & Baumeister, 2011; Baumeister, Schmeichel, et al., 2007), when a person has detected a discrepancy between the desired and current states, and is prepared to initiate actions to eliminate or reduce the discrepancy. At this point, one must have sufficient inner resources to alter its own responses. Because the common resource for self-control is limited, after exerting initial self-controlled regulation, the capacity for further control is decreased. This temporary deficit is known as ego-depletion.

Early evidence for ego-depletion was reported from Baumeister and colleagues laboratory (i.e., Muraven, Tice, & Baumeister, 1998; Baumeister, Bratslavsky, Muraven, & Tice, 1998). In one study, individuals who were required to regulate emotions while watching an upsetting video performed less well on subsequent handgrip stamina. In their other study, when participants were required to suppress thoughts about a white bear, they subsequently more quickly gave up on an

unsolvable anagram. In these studies, controlling aspects of the self that are normally spontaneous and impulsive, such as expressing emotions or the innate tendency to recall thoughts of a suggested object (the so-called cognitive rebound phenomenon) requires effortful self-control and draws from a reservoir of self-control resources. In doing so, it is argued that the resource is depleted, leaving less available resources to exert self-control on subsequent self-control tasks.

Following Baumeister and colleagues' initial tests, studies have replicated the ego-depletion effect extensively. Various spheres of self-control have been employed in laboratory settings, including controlling attention, controlling emotions, controlling impulses, controlling thoughts, cognitive processing, choice and volition, and social processing (Baumeister, Vohs, et al., 2007). Supporting the strength model proposal on a common resource of self-control, Hagger, Wood, Stiff, and Chatzisarantis's (2010) meta-analysis found a robust effect of depletion on performance on self-control task, with minimal variation across spheres of self-control.

While performing self-control acts may temporarily deplete the self-control resources, repeated practice of self-control over a period of time may enlarge or strengthen these resources. This effect has been shown particularly in the form of a less susceptibility to depletion. For instance, in Muraven, Baumeister, and Tice's (1999) study, participants' self-control performance was measured using a task of overriding physical discomfort (a handgrip task), given before and after an ego-depleting task (suppressing thoughts of a white bear) prior to a self-control training of tracking eating habits or regulating posture for two weeks, and following self-control training. As expected, following the self-control training, participants displayed better handgrip performance after the thoughts suppression task, as opposed to their pre-training handgrip performance.

Likewise, people's ability to regulate their use of stereotypes improved following two weeks of self-control training of using the nondominant hand or avoiding colloquialisms/cursing (Gailliot, Plant, Butz, & Baumeister, 2007). In a series of studies, Oaten and Cheng also showed that people's ability on the visual tracking task increased after they were trained over a period of months in formal academic

study (2006a), physical exercise (2006b), and financial monitoring (2007). Crucially, Muraven (2010) demonstrated that effect of self-control training on self-control performance following depletion cannot be explained by alternative mechanisms such as self-awareness (i.e., monitoring one's self-control activities with no specific attempt to practice self-control), self-fulfilling prophecies, or self-efficacy.

In short, the existing research appears to establish a direct relationship between self-control and ego-depletion such that greater exertion of self-control leads to more depletion. Until the resource for self-control can be replenished, one's ability to perform further self-control acts is compromised. Several counteracting variables for the depletion effect on self-control performance have been identified, such as glucose, humour, laughter, cash incentives, implementation intentions, and social goals (see Baumeister, Vohs, et al., 2007), and more recently, mindfulness (Friese, Messner, & Schaffner, 2012). Just as a muscle that gets stronger through exercise, a longer term effect of self-control practice also promotes a greater resistance to depletion (see Baumeister, Gailliot, DeWall, & Oaten, 2006).

#### 1.2.3.3 Self-control and aggression

In Gottfredson and Hirschi's (1990) *general theory of crime*, deficient in self-control has been acknowledged as a leading factor in understanding criminality and violent activity. In fact, individual differences in self-control have been shown to predict rates of behavioural problems and criminality over life-course development (Caspi, 2000; Moffitt et al., 2011). Sex differences in aggression have also been linked to differences in self-control between males and females (Burton, Cullen, Evans, Alarid, & Dunaway, 1998). Cognitive neuroscience models of self-control also demonstrate that self-control failure occurs when strong impulses overwhelm prefrontal cortical control mechanisms, and deficits in the function of prefrontal regions has been shown to predict aggression and violence (e.g., Heatherton & Wagner, 2011).

Self-control also seems to be related to the strategies people choose for managing and expressing their hostile thoughts and anger. Individuals high in self-control

reported lower outwardly directed aggression and less inclination to ruminate about their anger, as opposed to those low in self-control (Tangney, Baumeister, & Boone, 2004). Moreover, hostile thoughts and anger are more likely to manifest as aggressive behaviour when people's cognitive inhibition has been impaired (see Giancola, 2000). These findings suggest that individuals who lack the ability to control their anger are more likely to engage in aggressive behaviour.

DeWall, Baumeister, Stillman, and Gailliot (2007) provided a series of experiments on how ego-depletion may affect aggression (see also Denson, von Hippel, Kemp, & Teo, 2010; Finkel, DeWall, Slotter, Oaten, & Foshee, 2009; Stucke & Baumeister, 2006; Vohs, Glass, Maddox, & Markman, 2011). In one of DeWall et al.'s study, participants were allocated to a depletion condition (resisting the urge to eat a tempting donut) or non-depletion condition (resisting the urge to eat a radish). All participants then received an insulting feedback of their essay from an ostensible partner. Participants were then given an opportunity to prepare a spicy snack for their partner (whom had indicated a strong dislike for spicy foods). As expected, depleted participants gave more hot sauce to the partner than non-depleted participants. In subsequent studies, depleted participants showed higher aggressive responses (i.e., aversive noise blasts or negative job candidate evaluation) *only* when they had been insulted, but not in the absence of insulting provocation. In addition, the *intention* to aggress was less expressed by those high in trait self-control.

Since repeated practice of self-control has been shown to increase resistance to depletion, it may also decrease aggression. Empirical support for this prediction was reported by Denson, Capper, Oaten, Friese, and Schofield (2011; see also Finkel et al., 2009). In the first session of Denson et al.'s study, self-control trained participants were asked to use their nondominant hand in mundane tasks (e.g., brushing their teeth, opening doors, operating a computer mouse) for a 2-week period, exerting as much control as possible when performing these tasks. In the following laboratory session, both self-control and non-self-control trained participants received an insulting feedback from an ostensible partner, before they competed in an aversive noise blasts game with this partner. The results indicated that practicing self-control reduced aggressive behaviour in particular for those high

in trait physical aggression. Self-control trained participants also reported less angry rumination affect, even after controlling for trait anger, suggesting that self-control training may reduce aggression by facilitating self-control capacity to regulate anger.

The aforementioned research suggests that while depletion may not directly increase aggression, it limits self-control ability from acting on aggressive impulses when the urge to aggress is relatively strong (e.g., after receiving insulting feedback). This supports the strength model of self-control argument's that the proximal antecedent of aggression is often a failure of self-control (for an overview, see Denson, DeWall, & Finkel, 2012; DeWall, Finkel, & Denson, 2011). To our knowledge, whether or the effect of depletion on aggression can be counteracted by other variables has not been reported. In this thesis, we examine whether mindfulness may have the potential to attenuate such effect.

In the same way, studies examining the effect of self-control training on aggression typically involve the presence of provocation, either given following depletion (Finkel et al., 2009) or in the absence of depletion (Denson et al., 2011). It appears that the long-term effect of practicing self-control may not also directly reduce aggression unless people encounter some situations that trigger aggressive responding. To suggest evidence on the specific contribution of mindfulness on aggression independent of self-control mechanisms, mindfulness should also *uniquely* reduce provoked and unprovoked aggression in the absence of depletion condition.

### 1.2.4 Relating mindfulness, self-control, and aggression

#### 1.2.4.1 Distinguishing between mindfulness and self-control

Before building on a proposal for the plausible ways for testing the role of mindfulness and self-control *conjointly* on aggression, it is important to distinguish between mindfulness and self-control on conceptual levels.

Brown et al. (2007a, 2007b) have provided a thorough inspection on the differences between mindfulness and self-control, using the notion of "self" as a vantage point.

Fundamentally, there are two basic functions of consciousness (see also Western, 2001): *monitoring* experiences as they unfold (an "observer" function) and *controlling* the content of consciousness (a goal-directed agent of maintenance and change function). From the perspective of the feedback loop theory (Carver & Scheier, 1982; 2011), as well as other self-awareness theories, these functions are intertwined. The self as an *agent with an executive function* (Baumeister, 1998; 2011) exerts control over itself in order to achieve some future goals. For this purpose, self-controlled attention demands the monitoring of internal and external realities prior to and during control efforts. Attention is, therefore, goal-oriented, and mostly directed to aspects of the self through the experience of reflexive awareness (self-reflection).

Mindfulness serves a monitoring function of consciousness (Brown et al., 2007a, 2007b). This implies that with mindfulness, the two basic functions of consciousness can be disentangled. Since mindful attention is given on the task at hand, it allows one to fully experience one's own content of consciousness (i.e., thoughts, emotions, body sensations, values, plans, memory), in a situation of *exposure* (e.g., Baer, 2003; Linehan et al., 2007; Shapiro et al., 2006). Through exposure, one learns that the content of consciousness can be observed as a transitory state that is arising and passing. Sustained, nonjudgmental observation of any uncomfortable content of consciousness (e.g., anger, anxiety, pain), with minimal effort to suppress, avoid, or act on them should eventually lead to "the *extinction* of fear responses and avoidance behaviours previously elicited by these stimuli" (Baer, 2003, p.5).

As Brown and colleagues noted, the result of this process is a mental gap between attention and its objects, or between consciousness and its contents. A similar process has been acknowledged by Shapiro et al. (2006) as a fundamental shift in perspective or *reperceiving*. In this manner, mindfulness enables one to change the relationship to the consciousness and its content (e.g., S. C. Hayes et al., 2011; Segal et al., 2012), rather than altering the content of consciousness through self-controlled efforts.

Mindfully monitoring the "in-the-moment" experience also includes being aware of any thinking that one does about the future goals (and the past). Thus even though mindfulness is conceptually different from self-control, it is not necessarily antithetical to the goals of the self (Brown et al., 2007a). Research has documented a positive relation between individuals' tendency to be mindful and their reported ability to self-regulate (e.g., Barnes et al., 2007; Brown & Ryan, 2003; Fetterman, Robinson, Ode, & Gordon, 2010; Lakey, Campbell, Brown, & Goodie, 2007). Crucially, both mindfulness and self-control may facilitate adaptive responding to the environment, as opposed to the more habitual behaviour patterns. As presented in the two previous sections, the benefits of these two processes are found to be similar, including reductions in aggression.

Nevertheless, it is likely that the subjective outcome of mindfulness and self-control would different. Self-controlled regulation is depleting (see section 1.2.3.2), particularly in the short term, whereas mindful regulation appears to be vitalising and energising (Brown & Ryan, 2003; Williams & Penman, 2011). A series of studies (Brown, Kasser, Linley, & Ryan, 2009) showed that regardless of economic status, mindful individuals and those who participated in mindfulness meditation training reported a smaller financial desire discrepancy, which explained their higher levels of subjective well-being (affective state and life satisfaction). Thus mindfulness may promote the perception of being content that what one has is "enough".

There is also empirical support that trait mindfulness and participation in a mindfulness-based intervention (i) reduces the self-reported frequency of negative automatic thoughts about the self, and (ii) increases the ability to let go of these thoughts (Frewen, Evans, Maraj, Dozois, & Partridge, 2008). The combinations between the capacity to let go of negative thoughts and the perception of having enough (as opposed to wanting more) may therefore enable individuals to increase the degree of observation on the task at hand. The mindful capacity of observation also includes observing one's own attempt to exert self-control; thus may facilitate better choices about whether and when to control the self in ways that are more congruent with one's actual values (Brown et al., 2007a; Shapiro et al., 2006). Indeed, it has been suggested elsewhere that adaptive self-regulation should also

incorporate the capacity to *disengage* from unattainable goals as well as to *re-engage* effort and commitment towards pursuing more meaningful goals (Wrosch, Scheier, Carver, & Schulz, 2003; Wrosch, Scheier, Miller, Schulz, & Carver, 2003).

With these distinctions in mind, we now turn into a discussion on our proposal for investigating the role of mindfulness and self-control on aggression.

#### 1.2.4.2 Framework for mindfulness, self-control, and aggression

Empirical attempts to clarify the mechanism by which mindfulness may reduce aggression were conducted in Borders et al.'s (2010) correlational study in both undergraduates and non-undergraduates. Specifically, they proposed rumination (i.e., a process characterised by internal, sustained, and rigid attention to perceived discrepancies between current and desired states) as a mediator on the mindfulness and aggression link. Mindfulness has been suggested to break the repetive cycle of rumination by re-directing attention to the present (Shapiro, Oman, Thoresen, Plante, & Flinders, 2008). Borders et al. found that rumination partially mediated the link between mindfulness and anger and hostility but only amongst undergraduates. Thus, while rumination may be a chief mechanism between trait mindfulness and the emotional and cognitive components of aggression, other mechanisms may come into play for reductions of the behavioural components of aggression.

Accordingly, Borders et al. proposed that the effect that mindfulness has on *aggressive behaviour* may been mediated through relaxation, emotion regulation (e.g., altering thoughts or behaviour to cope with negative emotions), better cognitive functioning and flexibility (i.e., self-regulation of attention and cognitive inhibition), and decrease impulsivity. Some of these suggested mechanisms are related to self-control. Self-control was explicitly mentioned (but not tested) by Heppner et al. (2008) as a potential mediator between mindfulness and aggression.

As previously discussed, mindfulness may facilitate the self's ability to exert control in accordance to one's actual values (Brown et al., 2007a; Shapiro et al., 2006). Thus it is plausible that mindfulness may increase self-control capacity, and in turn

increases in self-control capacity would reduce aggression. At the same time, to clarify its distinct contribution, mindfulness should also produce additional reduction in aggression after accounting for self-control. There are several ways to examine our proposal that mindfulness may influence aggression in the same way it is proposed to be influenced by self-control, and that the effect of mindfulness may even be independent of and beyond that of self-control.

Firstly, the potential role of mindfulness and self-control on aggression may be investigated in the trait level. When encountering a situation that potentially could trigger aggressive responses (e.g., provocation), mindful individuals should be aware of their emotions (e.g., anger), but also should be less judgemental and reactive. Rather then being identified as an integral part of the self that needs to be acted upon, these emotions are being observed or witnessed as a state that is arising and passing, but not necessarily needing action. As described earlier (see section 1.2.4.1), keeping attention on emotions may lead to exposure and, in turn, extinction. Consequently, mindful individuals may experience the resulting aggression-related emotions to a reduced extent.

Individuals who are higher in self-control (e.g., discipline, hard-working, reliable) should be able to refrain from acting on aggressive impulses through their capacity of altering, overriding, or manipulating aggression-related emotions. However, they may be lacking in the awareness and acceptance of these emotions. When emotion acceptance is difficult, these individuals may try to avoid or suppress their emotions altogether. The paradoxical effect of emotion avoidance and suppression strategies in increasing the intensity and frequency of distressing thoughts and feelings has been well-documented (see e.g., Gross, 2002; Gratz & Roemer, 2004).

Moreover, difficulty in accepting emotions may activate the link between these emotions and aggression. For example, male's aggressive behaviour has been shown to be related to restrictive emotionality (presumably due to traditional sex roles), particularly emotional non-acceptance, rather than to the overall inability to self-regulate (Cohn, Jakupcak, Seibert, Hildebrandt, & Zeichner, 2010). In a current overview, Roberton, Daffern, and Bucks (2012) suggest that over-regulating

emotions may lead to aggressive behaviour by increasing negative affect, reducing inhibitions against aggression, compromising decision making processes, diminishing social networks, increasing physiological arousal, and hindering the resolution of difficult situations. Thus, even though self-control ability can decrease aggression and anger, mindfulness may arguably provide a more adaptive alternative. Indeed, a recent correlational study showed that trait mindfulness predicted incremental variance over trait self-control in psychological well-being and general distress (Bowlin & Baer, 2012).

Secondly, it is plausible to test the effect of state induced mindfulness on aggressive behaviour under ego-depleted condition. Self-control is often initiated when discrepancies between desired states and current states are detected (Carver & Scheier, 1982, 2011). Self-monitoring is also central to Novaco's (2003) conception of anger regulation. Inzlich and Gutsell (2007) demonstrated that after performing an initial self-control act, people's neural system that monitors the discrepancy between desired and current state (error-related negativity [ERN]) is weakened, suggesting that depletion limits the attentional system for initiating self-control acts.

Other potential mechanisms have also been identified as mediating variables for depletion effect on self-control performance, such as effort, perceived difficulty, negative affect, subjective fatigue, and blood glucose level—indicating the effortful, aversive nature of self-control tasks (Hagger et al., 2010). Alternatively, depleted people may become less motivated to exert self-control because they want to conserve their energy for more important future tasks (Tyler & Burns, 2009). These depleted people may then behave aggressively in particular when they encounter subsequent aggression-provoking events (see Denson et al., 2012; DeWall et al., 2011). By mindfully *exposing* oneself to the uncomfortable emotions, thoughts, or body sensations associated with depletion and provocation, one should be more tolerant to and less bothered by such experiences. This flourishing effect of mindfulness has been shown to counteract the effect of depletion on self-control performance by Friese et al. (2012).

Thirdly, laboratory study of mindfulness, self-control, and aggression may also be conducted in the absence of depletion. Extensive training in mindfulness (i.e., mindfulness-based interventions) has been shown to reduce aggression (see Fix & Fix, 2013; Shonin et al., in press). However, the similarities between features of mindfulness-based interventions and training in self-control have been highlighted in Masicampo and Baumeister's (2007) commentary. Specifically, both training involve regulation of one's thoughts and behaviours, adherence to exercises, and commitment to the exercises over extended periods. Therefore, mindfulness might well be argued to be simply one example of self-control training.

As a comparison, self-control training typically lasts for two weeks, compromising a regular practice of small acts of altering one's dominant response tendencies in daily activities such trying to improve one's posture, tracking eating habit, using nondominant hand in a mundane task, and avoiding colloquialisms/cursing (see Baumeister et al., 2006). By contrast, the accepted standard format for the MBSR programme is eight weeks of a total 26 hours class time (Carmody & Baer, 2009), where participants practice various meditation skills (i.e., body scan, hatha yoga, mindfulness of breathing, mindfulness of body sensations), along with discussion of stress, coping, and homework assignments, in addition to practising mindfulness during ordinary activities such as walking, standing, and eating (see Baer, 2003).

Given the complexity of the clinical package of mindfulness, the first few weeks has been reported to be especially difficult for novice practitioners (Segal et al., 2012). As speculated elsewhere, during the initial stages of mindfulness practice, cognitive control may be needed over the emotional reactions to assist attention on the task at hand (Holzel et al., 2011; Sauer et al., 2013); thus imposing a high degree of self-control exercises. However, as Brown et al. (2007a) argued, the aim of mindfulness practice is not to achieve the goals and demands of the self, but to provide a "space for awareness" to open. Unfolding the point at which this space of awareness could afford an independent effect of mindfulness over self-control is of particular interesting. To do so, the state of mindfulness should be able to strengthen the effect of self-control when the self-control resource has not been depleted, as well as when this resource has been bolstered (via self-control training).

#### 1.2.4.3 Role of individual differences in sensitivity to provocations and frustrations, and self-harm

As proposed by Lawrence (2006), assessment on individual differences in SP and SF may generate specific predictions about *who* is likely to respond aggressively to *which* triggers. Lawrence and Hutchinson's (2013b) recent study showed that after accounting for trait aggression, individuals high in SP behaved more aggressively when provoked but not when unprovoked. However, the moderating role of SP on the link between provocation and aggressive behaviour disappeared when participants were asked to deal with an initially non-aggressive partner. As such, Lawrence and Hutchinson suggested that it is plausible for those who are more sensitive to provocation to be more responsive not only to signs of provocation, but also to the absence of signs of aggression when aggression is expected (i.e., a partner who has the opportunity to behave aggressively but initially refrained from doing so).

As both mindfulness and self-controlled regulations may influence the link between aggressive impulses and aggressive behaviour, individual high in SP may also be of particularly responsive to these regulation strategies. Given that this thesis examines aggressive behaviour in response to provoked and unprovoked aggression, a similar effect may also occur amongst those high in trait aggression, although would probably less salient in those high in SF. Measuring individual differences in aggression, SP, and SF would allow us to examine to what extent mindfulness and self-control may attenuate aggression amongst individuals who are already predisposed to behave aggressively.

In this thesis, the role of mindfulness and self-control on aggression is also explored while accounting for individual differences in self-harm. While the literatures on aggression and self-harm are commonly separated, the presence of similar possible antecedents for self-harm and aggression (see section 1.2.1.2) indicates that these two harmful behaviour might be related.

Current self-harm theories appear to share the view that individuals who engage in self-harm do so partly to avoid, escape, manage, or regulate their very intense

emotions (e.g., Chapman, Gratz, & Brown, 2006; Gratz & Roemer, 2004; Linehan, 1993; Nock & Prinstein, 2004). Although there are other forms of aversive experiences (e.g., thoughts, memories, or body sensations), these too are likely to be unwanted due to the emotions accompanying them (Chapman et al., 2006). Similarly, aggressive behaviour has also been conceptualised as maladaptive emotion regulation strategy (see Roberton et al., 2012).

With the inclusion of mindfulness into the third-wave cognitive-behavioural approaches of self-harm, individuals are thought to become less avoidance to their very intense emotions, which may prevent repeated episodes of self-harm (Linehan, 1993; S. C. Hayes et al., 2011; Williams, Dugan, Crane, & Fennell, 2006). However, studies on emotion regulation difficulties amongst self-harmers have yet clarified the extent to which mindful and self-controlled emotion regulation may independently contribute to reductions in self-harm (see Slee, 2008).

## 1.3 RESEARCH QUESTIONS AND THESIS OVERVIEW

To summarise, in the light of the literature reviewed so far, the primary question addressed by the thesis is: “What is the effect of mindfulness on aggression?” In addition, the potential role of self-control on the potential link between mindfulness and aggression is investigated.

These research questions are elaborated through a series of studies. Study 1, presented in the following chapter, is a psychometric study exploring the relationships between mindfulness, self-control, and aggression (both to self and others) in its dispositional forms. Study 2 is an experimental study comparing the impact of mindfulness induction and self-control training on provoked and unprovoked aggressive behaviour. Study 3 is an experimental study exploring the role of mindfulness induction on provoked and unprovoked aggressive behaviour, under the condition of self-control ego-depletion. Given that the concept of mindfulness originates in Eastern contemplative traditions, it is necessary to test the

effect of mindfulness beyond the Western sample. Therefore, study 4 is a replication of Study 3, using a cross-cultural sample from Indonesia.

In this way, we will be able to suggest evidence for the unique contribution of mindfulness on aggression apart from the mechanism of self-control, and seek whether this potential effect varies across cultures. In addition, all studies in reported in this thesis also test the role of individual differences in aggression (physical aggression, verbal aggression, anger, hostility), sensitivity to provocations (SP) and frustrations (SF), and self-harm on the potential link between mindfulness, self-control, and aggression.

# CHAPTER TWO

## Study 1: Relationships between trait mindfulness, self-control, and aggression

### 2.1 INTRODUCTION

The current study explores the relationships between mindfulness, self-control, and aggression in their dispositional form. In addition, we assess the extent to which trait mindfulness and self-control may influence (i) self-harm in the same way as they may influence aggression, and (ii) the potential link between individual differences in sensitivity to provocation (SP) and frustration (SF) and aggression/self-harm.

#### 2.1.1 Individual differences in mindfulness, self-control, and aggression

An increasing amount of published work has pointed out that mindfulness may attenuate the associations between aggressive triggers and the difficult emotions experienced (see e.g., Wright et al., 2009 for a review). That is, although all individuals may encounter events in the environment that potentially could trigger aggressive responses, those who are mindful may experience the resulting negative emotions (e.g., anger) to a reduced extent. When conceptualised as a dispositional variable, mindfulness is associated with lower levels of self-reported physical and verbal aggression (Borders et al., 2010; Heppner et al., 2008, Kelly & Lambert, 2012), and with anger and hostility (Barnes et al., 2007; Borders et al., 2010; Brown & Ryan, 2003; Kelly & Lambert, 2012).

Some authors have theoretically suggested self-control (Border et al., 2010; Heppner et al., 2008) as one of the potential mediators between mindfulness and aggression. The link between self-control and aggression *per se* has been well documented (e.g., Caspi, 200; Gottfredson & Hirschi, 1990; Moffitt et al., 2011), and self-reported measures of mindfulness and self-control are strongly related with each other (Barnes et al., 2007; Brown & Ryan, 2003; Fetterman et al., 2010; Lakey et al., 2007). However, the differential association between mindfulness, self-control, and

aggression has not been reported. Therefore the primary aim of the current study is to explore the relationships between these variables in their dispositional forms.

Outside the area of aggression, Parto and Besharat's (2011) correlational study using high risk males from public high schools in Tehran has demonstrated the mediating role of self-control (as measured by the Self-Regulation Inventory [SRI -25]: Ibanez, Ruipérez, Moya, Marqués, & Ortet, 2008) on the link between mindfulness (Philadelphia Mindfulness Scale [PHLMS]: Cardaciotto et al., 2008) and psychological well-being. Specifically, they found that despite the direct effect of mindfulness on the psychological constructs of well-being and distress, mindfulness influenced self-control and in turn self-control affected psychological well-being. In the current study, we test whether a similar mediation model of trait self-control also applies on the association between trait mindfulness and trait aggression.

As discussed in Chapter 1, it is still questionable whether the benefit of mindfulness in predicting adaptive functioning can be separated from the more general self-control mechanism (Masicampo & Baumeister, 2007). Recently, Bowlin and Baer (2012) demonstrated that mindfulness (as measured by the Five Facet Mindfulness Questionnaire [FFMQ]: Baer et al., 2006) indeed accounted for significant variance in psychological well-being and general distress after accounting for self-control (Self Control Scale [SCS]: Tangney et al. 2004). In the current study, we examine the unique contribution of mindfulness on trait aggression after we control for the role of trait self-control and individual differences in aggression.

Furthermore, Bowlin and Baer has also found a moderating role of mindfulness on the link between self-control and general distress. Provided that mindfulness may predict incremental variance in aggression, it may also be possible for mindfulness to act as a moderator on the relationship between self-control and aggression. Self-controlled individuals might inhibit their impulsive responses of behaving aggressively, but lacking in the awareness and acceptance of aggression-related emotions. This excessive control of emotions can, at some point, increase aggressive behaviours (current review on the impact of deliberate emotion regulation on aggression is provided in Roberton et al., 2012). Conversely, the presence of a

mindful quality would enable self-controlled individuals to choose to self-regulate in healthier senses (Shapiro & Carlson, 2009), including *whether* and *when* they want to exert control (Brown et al., 2007a), and therefore act less aggressively. The moderating effect of trait mindfulness on the association between trait self-control and trait aggression is also explored the current study.

### 2.1.2 Link between mindfulness, self control, aggression, and self-harm

A previous review (Hilbrand, 2001) has pointed out that aggression to others and harm to the self (self-harm) often coexist; however, the risk assessment of these behaviours are commonly separated. Conceptually, it could be argued that those who self-harm are less likely to harm others, as some research has suggested that self-harm is psychological distress, particularly anger, directed inwards (Hills & Dallos, 2012). Repetition of self-harm was also associated with levels of *intropunitive hostility* (hostility towards the self) and hopelessness, but not with *extrapunitive hostility* and dominance (Brittlebank et al., 1990). Even so, the presence of similar possible mechanisms for self and others harm (e.g., Hillbrand, 2001; Placidi et al., 2001; Plutchick & van Praag, 1989; Roaldset et al., 2011), would mean that aggressive individuals may, in fact, also lack of inhibition to harm themselves.

When dealing with high levels of negative emotions, individuals may ruminate about the causes, situational factors, and consequences of these emotions, or use thought suppression as an attempt to stop ruminating on these emotions (Selby, Anestis, & Joiner, 2008). These self-controlled regulation strategies may deplete the resource of self-control and thereby increasing the association between rumination and the negative emotions (Denson, 2013). To break the vicious cycle between negative emotions, rumination, and thought suppression, individuals may then engage in a dysregulated behaviour (e.g., self-harm, aggression) in order to distract themselves from these emotions (Selby, Franklin, Carson-Wong, & Rizvi, in press; see also Roberton et al., 2012).

Indeed, emotional relief has been reported as the most common reason for self-harm in studies using self-report methodologies (Brown, Comtois, & Linehan, 2002; Chapman & Dixon-Gordon, 2007). Likewise, aggression and violence toward others may serve as an affect regulatory function (Berkowitz, 1990; 2008; Bushman, Baumeister, & Phillips, 2001; Jakupcak, Lisak, & Roemer, 2002). Ruminating about a provocation was also shown to increase the likelihood of displaced aggression, even following minor triggering events (Bushman, 2002; Bushman, Bonacci, Pederson, Vasquez, & Miller, 2005).

By contrast, mindfulness may decrease both over-engagement (e.g., rumination) and under-engagement (e.g., avoidance) of experiences, by bringing attention back with a nonjudgemental attitude (Bishop et al., 2004; A. M. Hayes & Feldman, 2004; Shapiro et al., 2006). The mindful lack of trying to automatically ruminate on or resist negative emotions may result in less need to harm the self and others.

Gratz and colleagues (Gratz, 2007; Gratz & Roemer, 2004) have argued that clinical definitions of emotion regulation should capture the awareness of and acceptance of negative emotions, as well as the ability to engage in goal-directed behaviours and inhibit impulsive behaviour. As such, the first two components are the core of mindfulness (Bishop et al., 2004; Brown & Ryan, 2003; Kabat-Zinn, 1994); whereas the latter resemble the spheres of self-control in self-control theory (Baumeister, Vohs, et al., 2007; Hagger et al., 2010; Tangney et al., 2004).

Few published studies that have investigated the association between *specific* components of emotion regulation and aggression/self-harm seem to yield inconsistent results. Gratz and Roemer's (2004) study reported no significant differences between components of emotion regulation and self-harming behaviour a non-clinical population. However, the frequency of partner abuse in their study was predicted by the self-control related components only. Another study (Slee, Garnefski, Spinhoven, & Arensman, 2008) showed that mindfulness-related and self-control related components independently distinguished between clinical self-harmers and non self-harmers. Yet another study (Slee, Spinhoven, Garnefski, & Arensman, 2008) found that only difficulties in the self-control related component

mediated the treatment effect on self-harming behaviour amongst clinical population. In the current study, we examine the role of mindfulness on self-harm after we controlled for the influence of self-control.

Furthermore, levels of anxiety and depression are frequently implicated in the literature examining the etiology of self-harm (see Hamza, Stewart, & Willoughby, 2012). Hence we also examine the impact of mindfulness and self-control on self-harm while controlling for the effect of anxiety and depression on self-harm.

It is also plausible, therefore, that mindfulness may moderate any relationships between self-control and self-harm in the same way it might moderate the link between self-control and aggression. Specifically, individuals who higher in both mindfulness and self-control might be less likely to self-harm compare to those who are higher in self-control but lower in mindfulness.

### 2.1.3 Individual differences in sensitivity to provocations and frustrations

General trait aggression is not the only factor determining why individuals may become aggressive in any particular situation. While person-based and situation-based antecedents of aggression are theoretically linked (see Anderson & Bushman's General Aggression Model, 2002), however, these factors are typically investigated separately (Lawrence, 2006).

As discussed in the previous chapter, Lawrence and colleagues (Lawrence, 2006; Lawrence & Hodgkins, 2009; Lawrence & Hutchinson 2013b) recommend examining individual differences in sensitivity to provocations (SP) and frustrations (SF) to generate a clear set of specific predictions about *who* is likely to respond aggressively to *which* triggers. Distinct relationships was shown between these traits and subscales of trait aggression (as measured with Buss & Perry's Aggression Questionnaire, 1992), in which SP was related to behavioural or overt aggression whereas SF to hostility and anger (Lawrence, 2006). This highlights the importance for the current study to scrutinise the potential effect of SP and SF on the link between mindfulness, self-control, and trait aggression.

Whilst provocations and frustrations are assumed to operate similarly by activating a network linking aggression-related cognitions, emotions, and behaviours (according to cognitive neoassociation theory, e.g., Berkowitz, 1990), mindfulness and self-control may arguably reduce the activation of these links, thereby decreasing the likelihood that individuals will act aggressively. Specifically, individuals who are high in SP and SF but at the same time either mindful (allow the negative emotions to be experienced and not acted upon), or self-controlled (those who experienced the aggressive triggers but do engage in self-control to resist behaving aggressively) should score lower in aggression. The proposed moderating role of mindfulness and self-control on the association between SP and SF and aggression would also be explored in this study.

A similar moderation model is also plausible for the prediction of self-harm. Apart from anxiety and depression, emotional vulnerability in the form of emotional reactivity (i.e., high sensitivity to emotional stimuli) and emotional intensity (i.e., the tendency to have extreme reactions) has been suggested as one of the individual risk factors for self-harm (Linehan, 1993). It is therefore conceivable that individuals who are more sensitive to provocations and frustrations triggers will be more likely to have engaged in self-harmful behaviours. In this sense, mindfulness and self-control might moderate any relationships between SP and SF and self-harm in the same way they moderate the link between these variables and aggression.

In sum, recent literature suggests two different perspectives on the relationships between mindfulness, self-control, and aggression. The first possibility is that self-control may *mediate* the relationship between mindfulness and aggression. The second one is that mindfulness may *moderate* the relationship between self-control and aggression. Testing both possibilities is of particular interest of the current study. Additionally, we explore whether (i) similar mediation and moderation models also predict individual differences in self-harm, and (ii) mindfulness and self-control moderate the effect of sensitivity to provocations and frustrations on aggression/self-harm.

## 2.2 HYPOTHESES

The current study examines the following primary hypotheses:

1. Trait mindfulness and trait self-control will be positively correlated to each other, negatively associated with trait aggression.
2. Trait self-control will mediate any relationships between trait mindfulness and aggression.
3. Trait mindfulness will account for significant variance in trait aggression after accounting for the potential influence of trait self-control.
4. Trait mindfulness will moderate the link between trait self-control and trait aggression.

The first set of secondary hypotheses concern the possible link between trait aggression and self-harm, and predicts that:

5. Individual differences in aggression will be positively associated with self-harmful behaviours.
6. Those who score higher in mindfulness and self-control will be less likely to self-harm, thus mirroring the associations with trait aggression.
7. Trait self-control will mediate any relationships between trait mindfulness and self-harm.
8. Trait mindfulness will account for significant variance in self-harm after controlling for:
    a. Trait self-control.
    b. Anxiety and depression.
9. Trait mindfulness will moderate the link between trait self-control and self-harm.

The next set of secondary hypotheses concern the role of individual differences in sensitivity to provocations (SP) and frustrations (SF), and predicts that:

10. Individual differences in SP and SF will be positively associated with trait aggression and self-harm.

11. Those who score higher in SP and SF, while at the same time are also mindful or self-controlled, will be less likely to:
    a. Harm others.
    b. Harm themselves.

We predict that individuals who are more mindful and more self-controlled will be less aggressive and self-harmless. Self-control will mediate the relationship between mindfulness and aggression/self-harm. Moreover, mindfulness will account for significant variance in aggression/self-harm after accounting for self-control and other covariates. Mindfulness will moderate the relationship between self-control and aggression/self-harm. Finally, both mindfulness and self-control will moderate any relationships between SP and SF and aggression/self-harm.

## 2.3 METHODS

### 2.3.1 Participants

Participants were recruited from the end of March until the middle of April 2011. To capture a wide range of data, we recruited general population (i.e., both university and non-university students) with no exclusion criteria. Due to extensive missing data, we removed 68 subjects out of the total 309 participants who agreed to participate in the survey (see section 2.3.7 for explanation of participants' removal). Our final sample consisted of 241 subjects (152 females, 4 did not report sex). Ages ranged from 18 to 41 ($M$ = 23.87, $SD$ = 6.00), 87.6% participants were university students. Just over 67.6% participants were White, 24.9% were Asian, 4.6% participants rated themselves as belonging to "Others" ethnical background, and 3.4% did not provide information. Concerning current mindfulness practice, 88.8% participants reported never having encountered mindfulness, 5.4% practised them once a year, 2.5% on monthly basis, 3.3% on weekly basis, and none practised them on daily basis.

### 2.3.2 Design

An online survey using a surveymonkey website was conducted in which participants completed the same set of questionnaires (Appendix 2.1) of individual differences in mindfulness (Mindfulness Attention Awareness Scale [MAAS]: Brown & Ryan, 2003), self-control (Self-Control Scale [SCS]: Tangney et al., 2004), aggression (Aggression Questionnaire [AQ]: Buss & Perry, 1992), sensitivity to frustrations and provocations (Situational Triggers of Aggressive Responses [STAR] scale: Lawrence, 2006), self-harm (Deliberate Self-Harm Inventory [DSHI]: Gratz, 2001), and depression and anxiety (Hospital Anxiety and Depression [HADS]: Zigmond & Snaith, 1983).

The online version of questionnaires was chosen not only to allow a relatively easy access of potential participants at low cost, but also to minimise participant's barriers in reporting relatively sensitive or socially undesirable behaviours such as aggression and self-harm. As shown by Metzger et al. (2000), similar types of computer-based interviews reduced under-reporting of sensitive information, which might otherwise occur due to participant's embarrassment, privacy concerns, or fear of negative reactions when the researcher is physically present.

### 2.3.3 Measures

*Mindful Attention Awareness Scale (MAAS: Brown & Ryan, 2003).* The MAAS consists of 15 items assessing the *absence* of a single factor encompassing *attention to* and *awareness of* the present reality in daily life (e.g., "I find myself preoccupied with the future or the past"), using a 6-point Likert-scale (1 = *almost always* and 6 = *almost never*). This reversed-items measure was supported by the authors' argument that for most people, mindless states are more accessible than mindful states. The MAAS was designed to exclude any attitudinal components (e.g., acceptance, trust, patience, empathy), motivational components (the "why" of awareness attention), and other constructs related to well-being. The original study of the MAAS showed satisfactory reliability for undergraduate students and adult populations ($\alpha$ = .82 and .87, respectively), as well as convergent and discriminant validity with various

constructs of psychological well-being (Brown & Ryan, 2003). Higher MAAS scores were also related to (i) less reactivity to threatening emotional stimuli as indicated by bilateral amygdale response and prefrontal cortical activation (Creswell, Way, Eisenberger, & Lieberman, 2007), and (ii) less self-reported aggression (as measured by Buss & Perry's Aggression Questionnaire, 1992) in both undergraduate students (Heppner et al., 2008), adult populations (Borders et al., 2010), and prospective criminal justice professionals (Kelly & Lambert, 2012). A recent validation of the MAAS was provided in MacKillop and Anderson (2007) and Brown et al. (2011). The MAAS receives the strongest support in a number of studies that explicitly tested the predictive validity of various mindfulness scales (Sauer et al., 2013).

*Brief Self-Control Scale (Brief SCS: Tangney, Baumeister, & Boone, 2004).* The SCS was developed based on extensive review of published studies on self-control processes and failures. The brief version of the SCS covered the same range of content with the full 36-item version, i.e., control over thoughts, emotional control, impulse control, performance regulation, and habit breaking Participants responded to 13 statements reflecting how they typically are (e.g., "People can count on me to keep on schedule") using a 5-point Likert-scale (1 = *not at all* and 5 = *very much*). The authors reported good internal reliability ($\alpha$ = .83 to .85) and test-retest reliability ($\phi$ = .87), as well as correlation with numerous adaptive functioning. Higher scores on the brief SCS were also associated with higher trait of mindfulness (as measured by Brown & Ryan's MAAS, 2003) in the context of romantic relationship (Barnes et al., 2007) and amongst frequent student gamblers (Lakey et al., 2007). A recent meta-analytic review found that compared to other widely used self-reported measures of self-control (i.e., the Barratt Impulsiveness Scale [Patton, Standfod, & Barratt, 1995] and the Low-Self-Control Scale [Grasmick, Tittle, Bursik, & Arneklev, 1993]), the SCS showed a stronger relationships to overall behaviour and allowed for a more finegrained analysis across various life domains (de Ridder et al., 2012).

*Aggression Questionnaire (AQ: Buss & Perry, 1992).* The AQ is one of the most broadly used self-report measures of aggression. It consists of four subscales, i.e., *physical aggression* (9 items, e.g., "If somebody hits me, I hit back"), *verbal aggression* (5 items, e.g., "I tell my friends openly when I disagree with them"),

*anger* (7 items, e.g., "When frustrated, I let my irritation show"), and *hostility* (8 items, e.g., "I am sometimes eaten up with jealousy"), along with a composite of the 29-score of trait aggression. The first two subscales represent the behavioural or overt component of aggression, followed by the emotional and the cognitive components. Participants indicated how accurately each item described the way in which they act when they feel angry or aggressive using a 5-point Likert-scale (1 = *very inaccurate* and 5 = *accurate*). The authors reported good test-retest reliability ($\alpha$ = .80, .76, .72, .72, .80 for physical aggression, verbal aggression, anger, hostility, and total score, respectively), and significant correlations with traits such as emotionality, impulsiveness, and competitiveness, as well as peer reports of aggression. Importantly, sex differences were found mostly in terms of physical aggression, followed by verbal aggression and hostility, but not in anger (Buss & Perry, 1992). Sex differences in aggression (males scoring higher than females in the behavioural components of aggression) have been consistently shown outside the U.S. samples, include in British (Archer, Kilpatrick, & Bramwell, 1995), Japanese (Nakano, 2001), Hungarian (Gerevich, Bácskai, & Czobor, 2007), and Japanese and Spanish (Ramirez, Andreau, & Fujihara, 2001) samples.

*Situational Triggers of Aggressive Responses scale (STAR scale: Lawrence, 2006).* The STAR consists of 22 items compromising two sub-scales, namely *sensitivity to provocations* (SP, 12 items, e.g., "A friend betrays me") and *sensitivity to frustrations* (SF, 10 items, e.g., "I experience family dispute"). Each item is rated using a 5-point Likert-scale (1 = *very inaccurate* and 5 = *very accurate*). The author reported good internal reliability ($\alpha$ = .82 and .80 for SP and SF, respectively) and convergent validity with measures of traits associated with aggressive behaviour, including with Buss and Perry's (1992) AQ. Additionally, the factor congruency for both subscales was stable across males and females (Lawrence, 2006).

*Deliberate Self-Harm Inventory (DSHI: Gratz, 2001).* Participants indicated "yes" or "no" to a list of 17 items (e.g., "Have you ever intentionally (i.e., on purpose), cut your wrist, arms, or other area(s) of your body? (without intending to kill yourself)?"). If the answer was yes, participants were asked to rate the number of times they have administered each act. Responses to item number 17 (i.e., "Have

you ever intentionally done anything else to hurt yourself that was not asked about in this questionnaire? If yes, what did you do to hurt yourself?") are assessed qualitatively, and would only be included if they were consistent with the definition of self-harm used here, i.e., "the deliberate, direct destruction of body tissue without conscious suicidal intent, but resulting in injury severe enough for tissue damage (e.g., scarring) to occur" (Gratz, 2001, p.255). High internal consistency ($\alpha$ = .82) and test-retest reliability ($\phi$ = .68, $p$ < .01), as well as good construct, convergent, and discriminant validity were reported (Gratz, 2001). In the current study, we followed Gratz & Chapman's (2007) recommendation to use a cutoff of five episodes of self-harm, since this number is considered to be clinically meaningful. Thus as a final score, we derived a dichotomous self-harm variable by assigning a score of "1" to participants who provided the rating of "five times or more" on any items, and a score of "0" to the rest of the participants. Evidence for the construct and predictive validity of the DSHI was further reported in Fliege et al. (2006).

*Hospital Anxiety and Depression (HADS: Zigmond & Snaith, 1983).* Participants rated 14 questions relating to their current state of *anxiety* (7 items, e.g., "Worrying thoughts go through my mind") and *depression* (7 items, e.g., "I have lost interest in my appearance") on scale 0 to 3 (0 = *not at all* and 3 = *very often*). A validity study of the HADS (Bjelland, Dahl, Haug, & Necklemann, 2002) demonstrated its reliability in assessing the symptom severity and occurrence of anxiety disorders and depression (mean $\alpha$ = .83 for anxiety and .82 for depression) amongst somatic, psychiatric, and primary care patients and general population. In the normative sample, the total levels of anxiety and depression from 0 to 7 is considered to be *normal*, 8 to 10 is *borderline*, and 11 to 21 is *of clinical significance* (Zigmond & Snaith, 1983).

### 2.3.4 Power calculation

A precise effect size for this study could not be predicted due to of a lack of previous similar research. To detect a small effect ($d$ = .10) from six predictor variables (i.e., trait mindfulness, trait self-control, sensitivity to provocations and frustrations, anxiety and depression), and given the power of .80 and an alpha level of .05, this

study required 143 participants as calculated by G*Power 3 Version 3.1.7 (2013; see Faul, Erdfelder, Buchner, & Lang, 2009). If the demographic factors (i.e., current educational status, sex, age, race/ethnicity, and current mindfulness practice) are included as predictors, the total sample required would be 179.

### 2.3.5 Procedure

Since the study aimed to access both university and non-university students, potential participants were contacted not only via posters/leaflets on campus and the University of Nottingham mailing lists, but also through the social networking site (*Facebook*) by asking the researchers' colleagues from non-academic groups to post the advertisement of the study on their Facebook pages. A statement about the confidentiality nature of the study was made in these advertising materials (Appendix 2.2), along with its direct website link.

Interested participants were first shown an electronic information sheet indicating the purpose of the study and the contact details of the researchers (Appendix 2.3). They were told that the study was not concerned with their actual levels of mindfulness, self-control, aggression, and self-harm—but in how those behaviours and propensities were associated with each other. An electronic consent form was then displayed with relevant information (Appendix 2.3), including a statement that participants are free to withdraw at any time. Those who chose to participate were then presented with a series of questions (Appendix 2.1). The MAAS was presented first, followed by the SCS, HADS, STAR, AQ, and DSHI, respectively. In any case, starting a survey with questions that are not particularly personal or sensitive is a good strategy to minimise unwillingness to continue the study (Goodwin, 2010). Upon completion of the study, participants were required to provide demographic information consisting of current educational status (university/non university student), sex, age, race/ethnicity, and current mindfulness practice (defined as "a specific meditational practice in directing attention without making any judgment"). They were also given an option to enter an email address to win a £25 prize draw

incentivising the study. At the end of the survey, participants were debriefed and given help and support information (Appendix 2.5).

### 2.3.6 Data analysis

Analyses were performed on the data using the IBM SPSS statistics 20.0 (2011). The relationships between demographic factors and self-reported measures were assessed using one-way ANOVAs or independent *t*-tests (for current educational status, sex, race/ethnicity, and current mindfulness practice), Pearson's correlation (for age), and Chi-square test (for the dichotomous self-harm measure).

#### 2.3.6.1 Link between mindfulness, self-control, and aggression

The associations amongst self-reported measures were explored using zero-order correlations. On examination of these correlations, Hypothesis 1 would be confirmed if there is a positive correlation between trait mindfulness and trait self-control and negative correlations between these traits and trait aggression.

The possible relationships between mindfulness, self-control, and aggression were tested with bootstrapping method. Specifically, we used (i) Preacher and A. F. Hayes's (2011) macro called INDIRECT (for Hypothesis 2 and 3), and (ii) A. F. Hayes's (2012a) macro called PROCESS (for Hypothesis 4).

For Hypothesis 2 and 3, we tested whether the relationship between trait mindfulness (predictor) and aggression (outcome) would be mediated by trait self-control (proposed mediator). The main outcome was trait aggression. Additionally, the four aggression subscales (physical and verbal aggression, anger, and hostility) were analysed separately as outcomes. A mediation model with only one mediating variable is known as simple mediation (see Figure 2.1).

Traditionally, mediation testing followed a four-step *causal approach* popularised by R. M. Baron and Kenny (1986; see also Kenny, 2013). With this approach, several hierarchical regression analyses are conducted and significance of the coefficients is

examined at each step. At Step 1, the outcome (*Y*) is regressed on the predictor (*X*) to determine a significant total effect (*c* path). At Step 2, the proposed mediator (*M*) is regressed on the predictor (*a* path). At Step 3, the outcome is regressed on *both* the mediator and the predictor. As such, the predictor is controlled to establish the effect of the mediator on the outcome (*b* path). One would proceed to Step 4 if there are significant relationships from Step 1 to 3. However, current researchers have strongly advocated that it is not always necessarily for the *c* path to be significant in order to establish mediation (for a review, see e.g., MacKinnon, Fairchild, & Fritz, 2007; Zhao, Lynch & Chen, 2010). At Step 4, if the direct effect of the predictor on the outcome is zero after controlling for the mediator (*c'* path) then the finding supports full mediation. If the direct effect decreases but the reduction is still different from zero then the finding supports partial mediation. It should be noted that statistically, Step 3 and Step 4 are estimated in the same equation. The amount of mediation is called the *indirect effect* (*ab* path).

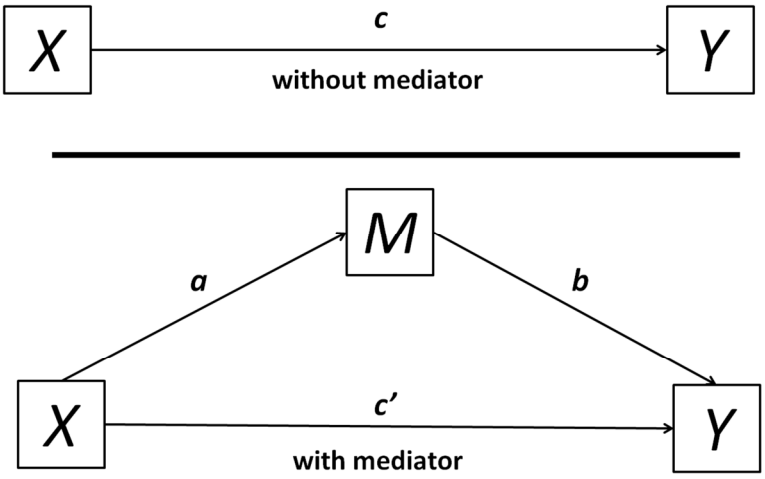


Figure 2.1. Simple mediation model. The causal effect of *X* on *Y (c)* is apportioned through its indirect effect on *Y* through *M (ab)* and its direct effect on *Y (c')*. *X* = predictor (trait mindfulness), *Y* = outcome (trait aggression or self-harm), *M* = proposed mediator (trait self-control). *a, b, c, c'* = unstandardised regression coefficient. Reprinted from Kenny (2013).

In the causal approach, the size of the mediation is not directly estimated, but is mathematically derived as the product of the *a* and *b* paths. Since the total effect of the predictor on the outcome is equal to the sum of the direct and indirect effects, *c*

= *c'*+ *ab,* the indirect effect is calculated as *ab = c – c'.* The main problem with this calculation is that a confidence interval for the population indirect effect could not be obtained (Pituch, Whittaker, & Stapleton, 2005; for a thorough discussion on the limitations of the causal approach consult MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Preacher & A. F. Hayes, 2008). An initial attempt to perform a single test of *ab* was proposed by Sobel (1982). The Sobel test, however, assumes normality of the sampling distribution of the indirect effect, which is typically violated in practice (e.g., MacKinnon, Lockwood & Williams, 2004; Preacher & A. F. Hayes, 2004; Shrout & Bolger, 2002).

Conversely, with *bootstrapping method*, the sampling distribution of *ab* is estimated empirically; therefore no assumptions are made about this distribution (see e.g., MacKinnon et al., 2004; Preacher & A. F. Hayes, 2008). To bootstrap an indirect effect, the available sample size *n* is re-sampled with replacement intensively for a total of *k* times to estimate the *a* and *b* as usual (Preacher & A. F. Hayes, 2008, suggest using 5,000 resamples for final reporting). These estimates of *a* and *b* are used to calculate *ab** (the indirect effect in a single resample), and the distribution of the *k* values of *ab** provides a nonparametric approximation of the sampling distribution of *ab.* The mean of the *k* estimates of *ab** represents the indirect effect. Since the mean of the *k* is not exactly equal with the indirect effect, a correction for bias is made, typically using confidence intervals (MacKinnon et al., 2004; Preacher & A. F. Hayes, 2008). If the bias-corrected confidence intervals does not include zero, one can be confident that a significant mediation has occurred.

Hypothesis 2 would be supported if there is a zero in the bias-corrected confidence intervals of path *ab* (indirect effect of self-control on the link between mindfulness and aggression). Hypothesis 3 would be confirmed if path *c'* (the direct effect of mindfulness on aggression) is still significant after the inclusion of trait self-control.

For Hypothesis 4, we tested whether the relationship between trait self-control (predictor) and aggression (outcome) would be moderated by trait mindfulness (proposed moderator). Trait aggression was used again as the main outcome, and the four aggression subscales were analysed separately as outcomes. A moderator

model with only one moderator variable is known as simple moderation (see Figure 2.2). The variables are mean-centered so that their coefficients are interpretable within the range of the data (A. F. Hayes, 2012b).

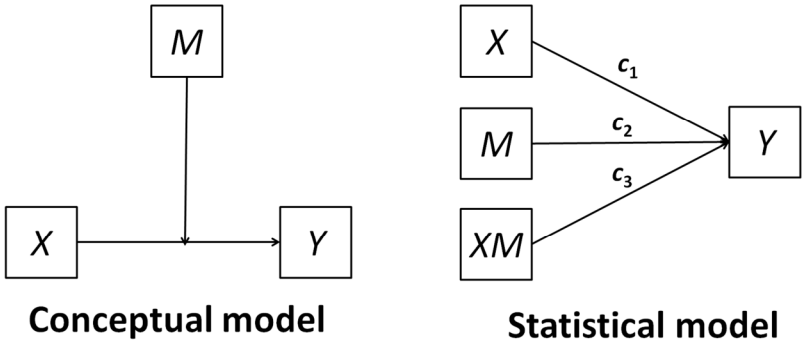


Figure 2.2. Conceptual and statistical models for simple moderation. In the statistical model, *Y* is estimated as a weighted function of *X*, *M*, and the product of *X* and *M* (*XM*). *X* = predictor (trait self-control), *Y* = outcome (trait aggression or self-harm), *M* = moderator (trait mindfulness). $c_1$, $c_2$, $c_3$ = unstandardised regression coefficient. Reprinted from A. F. Hayes (2012b, p.33).

Theoretically, *X* is depicted to exert an influence on *Y*, and this effect is proposed to be influenced or *moderated* by *M* (the Conceptual Model in Figure 2.2). These effects are estimated mathematically (the Statistical Model in Figure 2.2, Statistical Model) in the form of a linier equation: $Y = i + c_1X + c_2M + c_3XM + ey$. From this equation, it can be seen that the effect of *X* on *Y* is a function of *M*, since $Y = i + (c_1 + c_3M)X + c_2M + e_y$ (for further details, consult A. F. Hayes, 2012b). The ($c_1 + c_3M$) function represents the *conditional effect of X on Y* or "simple slope" for *X*, in which $c_1$ estimates the effect of *X* on *Y* when *M* = 0, and $c_3$ estimates how much the effect of *X* on *Y* changes as *M* changes by one unit. The main focus in a moderation model is whether $c_3$, the interaction coefficient between *X* and *M*, is statistically different from zero. Additionally, the significance of the change in the total variance in Y due to this interaction is also useful. When the null hypothesis is rejected, the magnitude of the conditional effect of *X* at various values of *M* is elaborated, along with a standard error, *t*, and *p*-value. For dichotomous *M*, this effect is derived at each of the two values of *M*. If *M* is continuous, *M* can be set to various values that

represent *low* (a standard deviation below the mean), *moderate* (the mean), and *high* (a standard deviation above the mean).

Hypothesis 4 would be confirmed if $c_3$, the interaction coefficient between self-control and mindfulness, is statistically different from zero.

#### 2.3.6.2 Link between mindfulness, self-control, aggression, and self-harm

Using independent sample *t*-test, we tested the differences between self-harmers and non-self harmers on the measures of (i) trait aggression and its four subscales (Hypothesis 5), and (ii) trait mindfulness and self-control (Hypothesis 6).

For Hypothesis 7, 8a, and 8b, the same INDIRECT macro (Preacher & A. F. Hayes, 2011) was used with the dichotomous self-harm variable (yes vs. no) as the outcome, to test the effect of the predictor (trait mindfulness) and mediator (trait self-control) of self-harm.

Principally, when the outcome is dichotomous, the logit-transformed probability is modeled as a linear relationship with the predictors, known as *logistic regression analysis* (see e.g., MacKinnon & Dwyer, 1993). INDIRECT macro estimates the *b, c,* and *c'* paths accordingly using logistic regression, based on a Netwon-Raphson iteration algorithm. To determine if the overall model is significant, the statistics for maximumlikelihood estimate, McFadden $R^2$, Cox & Snell $R^2$, Nagelkerke $R^2$ are produced. The importance of each variable is indicated by the significant *p* value of Wald statistic. Crucially, the confidence intervals for the indirect effect (*ab*) are still estimated as the product of the *c'* and the *b* paths. However since *ab* and *c* are scaled differently, the equation $c - c'$ cannot be used as a substitute for the total indirect effect or as the proportion of the effect that is mediated (Preacher & A. F. Hayes, 2008). Hence the bias-corrected confidence intervals of path *ab* would provide information about the mediation role of self-control on the link between mindfulness and self-harm (Hypothesis 7). Hypothesis 8a and 8b would be confirmed if path *c'* (the direct effect of mindfulness on self-harm) is still significant after the inclusion of trait self-control (and controlling for anxiety and depression).

The moderation model of trait mindfulness on the link between trait self-control and self-harm (Hypothesis 9) would be tested in the same way with Hypothesis 4.

#### 2.3.6.3 Role of individual differences in SP and SF

The role of SP and SF on aggression and self-harm (Hypothesis 10) could be supported if (i) the zero-order correlations indicate a positive correlation between SP and SF and trait aggression (ii) independent sample *t*-test reveal the differences between self-harmers and non-self harmers on the measures of SP and SF.

The moderation of mindfulness and self-control on the link between SP and SF and aggression (Hypothesis 11a) and self-harm (Hypothesis 11b) would be tested with the same PROCESS macro (A. F. Hayes, 2012a). On separate analyses for SP and SF, we used trait mindfulness and self-control as the moderators; trait aggression, the four aggression subscales, and self-harm as the outcomes. The moderator model in Figure 2.2 is modified to include two moderators (see Figure 2.3).

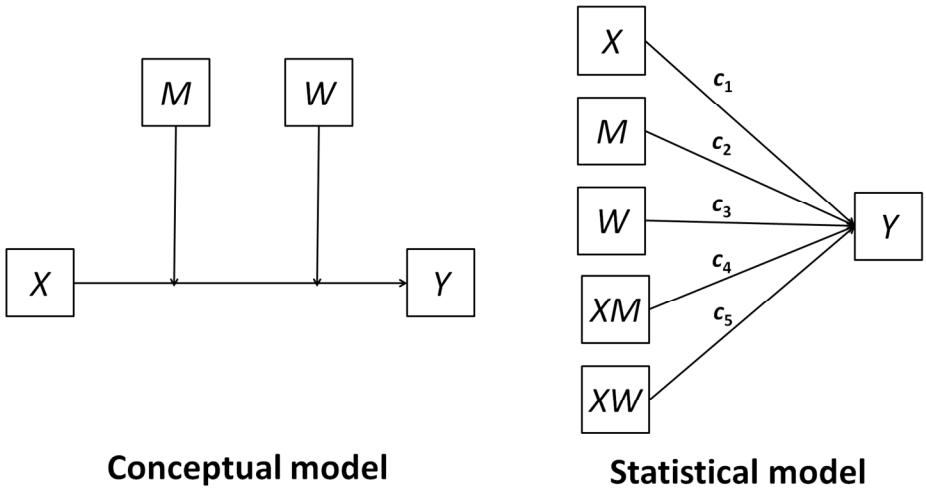


Figure 2.3. Conceptual and statistical models for additive moderation . *X* = predictor (SP or SF), *Y* = outcome (aggression or self-harm), *M* = first moderator (trait mindfulness), W = second moderator (trait self-control). $c_1$, $c_2$, $c_3$, $c_4$, $c_5$ = unstandardised regression coefficient. Reprinted from A. F. Hayes (2012b, p.33).

The effect of *X* on *Y* is proposed to be moderated by both *M* and *W*. Mathematically, $Y = i + c_1X + c_2M + c_3W + c_4XM + c_5WM + e_y$. It can be seen that the effect of *X* on *Y* is additively dependent on both *M* and *W*, since $Y = i + (c_1 + c_4M + c_5W)X + c_2M + c_3W +$

$e_y$. The conditional effect of *X* on *Y* is = ($c_1$ + $c_4M$ + $c_5W$). If both $c_4$ and $c_5$ are statistically different from zero, the magnitude of the conditional effect is being inspected at various combinations of *M* and *W*.

### 2.3.7 Data preparation

Prior to further analysis, we examined all measures for extensive missing data leaving in total 241 participants. The pattern of the missing data was: 25 subjects did not filled out any items on the survey, 11 did not continue to the second half of the first survey (the MAAS), 1 did not continue to the second survey (the SCS), 3 did not continue to the third survey (the HADS), 10 did not continue to the fourth survey (the STAR), 6 did not continue to the fifth survey (the AQ), 11 did not continue to the second half of the fifth survey, and 1 did not continue to the last survey (the DSHI). These 68 participants were removed from the analysis.

## 2.4 RESULTS

### 2.4.1 Influence of demographic factors

We firstly conducted analyses on the associations between demographic factors (i.e., current educational status, sex, age, race/ethnicity, current mindfulness practice) and our predictors (trait mindfulness, trait self-control, sensitivity to provocations [SP] and sensitivity to provocations [SF]). Any significant demographic factors would be controlled in the relevant subsequent analyses.

Age was positively associated with mindfulness ($r$ = .21, $p$ < .01) and self-control ($r$ = .25, $p$ < .001). Non-students participants were higher in mindfulness ($t$(239) = 4.18, $p$ < .0001; *M* non-students = 4.38, *SD* = .68 vs. *M* students = 3.77, *SD* = .76) and self-control ($t$(239) = 4.45, $p$ < .0001; *M* non-students = 3.47, *SD* = .58 vs. *M* students = 2.95, *SD* = .60), but lower in SP ($t$(239) = 1.99, $p$ < .05; *M* non-students = 2.69, *SD* =.78 vs. *M* students = 2.99, *SD* = .76). SF was neither related to age ($r$ = .04, $p$ = .46) nor educational status ($t$(239) = -.46, $p$ = .15).

As the non-students participants were older than students ($t(234) = 9.41$, $p < .0001$; *M* non-students = 32.10, *SD* = 4.76 vs. *M* students = 22.68, *SD* = 5.17), a partial correlation was carried out between age, mindfulness, and self-control after controlling for educational status. Although age was still related to self-control ($r = .14$, $p < .05$), it was no longer related to mindfulness ($r = .08$, $p = .20$). Hence, age and current educational status were both included as covariates in the main analyses.

Sex differences were not linked to mindfulness ($t(235) = .70$, $p = .48$), self-control ($t(235) = .57$, $p = .57$), SP ($t(199.76) = .08$, $p = .93$), or SF ($t(235) = -1.54$, $p = .13$). No differences associated with ethnicity were found in mindfulness ($F(2,231) = .81$, $p = .44$), self-control ($F(2,231) = 1.63$, $p = .20$), SP ($F(2,231) = .81$, $p = .45$), or SF ($F(2,231) = .56$, $p = .57$). Interestingly, participants with mindfulness experience did not indicate differences in mindfulness ($F(3,237) = .94$, $p = .42$), self-control ($F(3,237) = .65$, $p = .56$), SP ($F(3,237) = 1.66$, $p = .18$), or SF ($F(3,237) = 1.39$, $p = .25$).

### 2.4.2 Trait aggression scores

A mean score of aggression (i.e., the average score across four AQ subscales) was calculated as a main trait aggression measure. Sex differences in aggression are shown in Table 1 (*N* = 237 participants, as 4 subjects did not report their sex). No sex differences were found in general trait aggression, anger, or hostility. Males, however, scored significantly higher than females on physical and verbal aggression. The results support the notion that the effect of sex differences is more salient with regard to aggressive behaviours than with aggressive feelings (Lawrence, 2006).

Table 2.1.
*Means for aggression measures based on participants' sex*

| Aggression measures | Males (*n* = 85) | Females (*n* = 152) | *t* |
|---|---|---|---|
| | *M* (*SD*) | *M* (*SD*) | |
| Trait aggression | 2.62 (0.62) | 2.47 (0.67) | $t(235) = 1.67$, $p = .10$ |
| Physical Aggression | 2.48 (0.87) | 2.03 (0.80) | $t(235) = 4.01^{***}$ |
| Verbal Aggression | 3.03 (0.87) | 2.78 (0.80) | $t(235) = 2.26^{*}$ |
| Anger | 2.34 (0.71) | 2.51 (0.84) | $t(198.48) = -1.64$, $p = .10$ |
| Hostility | 2.63 (0.78) | 2.57 (0.86) | $t(235) = .51$, $p = .61$ |

$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

Higher levels of trait aggression were also linked to ethnicity ($F(2,231) = 4.85$, $p < .01$; *M* Asian = 2.75, *SD* = .55 vs. *M* "Others" = 2.53, *SD* = .58 vs. *M* White = 2.44, *SD* = .68). In addition, Asian participants reported more anger than White ($F(2,231) = 6.26$, $p < .01$; *M* Asian = 2.76, *SD* = .68 vs. *M* White = 2.35, *SD* = .81). Participants who reported engaging in current mindfulness practice were higher in trait aggression ($F(3,237) = 3.92$, $p < .01$), anger ($F(3,237) = 4.51$, $p < .01$), and hostility ($F(3,237) = 3.02$, $p < .05$), compared with those with no experiences. Neither age nor current educational status was related to the aggression measures.

### 2.4.3 Self-harm scores

A score of "1" was assigned to those who reported having engaged in self-harm five or more times in any of the 17 DSHI items (Gratz & Chapman, 2007). For item number 17 (i.e., qualitative description of self-harm methods that had not been included in the first 16 items), we reassessed participants' responses against Gratz's (2001) definition of self harm. Descriptions like "Hair straightens to burn myself" was included, but "Refusing food, refusing sleep, smoking, drinking, deliberate vomiting" was excluded. In total, 49 participants (20.30%) were qualified as self-harmers.

With reference to the methods of self-harm, the most frequent method was skin cutting (used by 22% of the total sample, with equally prevalent across males and females [$\chi^2(1) = 1.86$, $p = .17$; females = 11.30%, males = 5.90%]), resembling Gratz's (2001) developmental study of the DSHI.

The only demographic factor that affected self-harmful behaviours was age ($t(118.25) = 3.64$; *M* self-harmers = 21.76, *SD* = 4.00 vs. *M* non self-harmers = 24.43, *SD* = 6.32). We dichotomised ethnicity to White and non-White because the expected count for the "Other" ethnic background was less than 5. Self-harm status did not vary as a function of ethnicity ($\chi^2(1) = 2.58$, $p = .11$), current mindfulness practice ($\chi^2(1) = .06$, $p = .80$), or participant's sex ($\chi^2(1) = .74$, $p = .39$; *n* females = 34 [22.40%] vs. *n* males = 15 [17.60%]). Although classic self-harm literature typically demonstrates that females engage in more self-harm behaviours, sex differences in

self-harm may be more pronounce in early adolescence (for a review, see Hamza et al., 2012). In this sample, the odds of females engaging in self-harmful behaviours were only 1.38 times higher than males.

### 2.4.4 Preliminary analysis

Table 2.2 (below diagonal) presents the zero-order correlations amongst continuous variables and descriptive statistics (*N* = 241). Internal reliabilities of measures ranged from adequate ($\alpha$ = .74) to quite high ($\alpha$ = .90). All measures were generally associated with each other, and in the expected direction. Specifically, mindfulness and self-control were positively correlated to each other and negatively correlated to all of the aggression variables. Hypothesis 1 was confirmed such that individuals who were more mindful and more self-controlled were less aggressive.

Table 2.2.
*Zero order correlations and psychometric properties of measures*

| Measures | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| MAAS (1) | 1.00 | | | | | | | | |
| SCS (2) | .50** | 1.00 | | | | | | | |
| Total AQ (3) | -.36** | -.35** | 1.00 | | | | | | |
| AQ Physical (4) | -.20** | -.24** | .78** | 1.00 | | | | | |
| AQ Verbal (5) | -.13* | -.15* | .76** | .44** | 1.00 | | | | |
| AQ Anger (6) | -.33** | -.28** | .83** | .57** | .52** | 1.00 | | | |
| AQ Hostility (7) | -.47** | -.44** | .78** | .45** | .44** | .55** | 1.00 | | |
| STAR Provocations (8) | -.18** | -.28** | .45** | .33** | .29** | .38** | .44** | 1.00 | |
| STAR Frustrations (9) | -.27** | -.34** | .46** | .28** | .26** | .45** | .46** | .74** | 1.00 |
| *M* | 3.84 | 3.02 | 2.53 | 2.20 | 2.88 | 2.46 | 2.60 | 2.95 | 2.71 |
| *SD* | .78 | .62 | .65 | .85 | .83 | .80 | .84 | .77 | .82 |
| $\alpha$ Cronbach | .88 | .82 | .90 | .84 | .74 | 78 | .80 | .88 | .87 |

*Note.* MAAS = Mindful Attention Awareness Scale; SCS = Self-Control Scale; STAR = Situational Triggers of Aggressive Responses; AQ = Aggression Questionnaire
*$p$ < .05; **$p$ < .01; ***$p$ < .001

Additionally, none of these associations were significantly altered when we run partial correlations controlling for sex, ethnicity, or current educational status. The relation between trait mindfulness and verbal aggression fell just short of significance when we control for age ($r$ = -.13, $p$ = .06) and current mindfulness practice ($r$ = -.12, $p$ = .06).

### 2.4.5 Mediation of self-control on the link between mindfulness and aggression

For Hypothesis 2 and 3, a bootstrapping method with 95% bias-corrected confidence intervals (based on 5,000 bootstrap resamples, *N* = 241) was used to test the mediating role of self-control on the link between mindfulness and aggression.

#### 2.4.5.1 Trait aggression

Hypothesis 2 was confirmed such that self-control significantly mediated the relationship between mindfulness and trait aggression. Specifically, mindfulness predicted self-control (*B* = .40, *SE* = .04, *p* < .0001), while trait aggression was predicted by mindfulness (*B* = -.30, *SE* = .05, *p* < .0001) and self-control (*B* = -.24, *SE* = .07, *p* < .05). Thus the paths from mindfulness to self-control (*a* path) and from self-control to aggression (*b* path) were both significant. Crucially, self-control mediated the relationship between mindfulness and trait aggression (*ab* path: *B* = -.09, *SE* = .03, 95% CI [-.16, -.04]). The direct effect of mindfulness was still significant (*B* = -.20, *SE* = .05, *p* < .001) when accounting for self-control (*c'* path), indicating a partial mediation. This latter finding supported that mindfulness accounted for significance variance in trait aggression after accounting for self-control (Hypothesis 3).

A very similar pattern of results emerged when the hypothesised covariates (i.e., current educational status, sex, age, race/ethnicity, and current mindfulness practice) were controlled. Due to some unreported demographic information, the bootstrapping procedure allowed data from 233 samples only (listwise deletion). All paths were still significant, and self-control partially mediated the link between mindfulness and trait aggression (*B* = -.10, *SE* = .03, 95% CI [-.17, -.05]). Again, mindfulness accounted for significant variance in trait aggression after controlling for covariates (*B* = -.20, *SE* = .06, *p* < .001). Significant partial effects of covariates were found across sexes (*B* = -.18, *SE* = .08, *p* < .05) and ethnicity (*B* = .18, *SE* = .07, *p* < .05). On examination of the specific factors, higher levels of trait aggression were associated with being male and Asian.

#### 2.4.5.2 Aggression subscales

To further examine the proposed mediation model, the analysis was repeated for each of the four trait aggression subscales (see Table 2.3). It can be seen that the total effect of mindfulness was significant for all aggression subscales (*c* path). The effect of self-control was not significant on verbal aggression (*B* = -.15, *p* = .60), therefore no mediation model could proposed on this subscale. A significant mediation effect was demonstrated for the three other subscales (see *ab* path*)*. Thus Hypothesis 2 was partly confirmed for the mediating role of self-control on the relationship between mindfulness and physical aggression, anger, and hostility. Further, with the inclusion of self-control, the predicting role of mindfulness on physical aggression was no longer significant (*B* dropped from -.22 to -.12). Mindfulness still, however, significantly predicted anger and hostility, indicating its unique contribution on these subscales (Hypothesis 3).

Table 2.3.
*Mediation models with bootstrapping method, using mindfulness as predictor, self-control as mediator, aggression subscales as outcomes*

| Model tested | Physical aggression | | Verbal aggression | | Anger | | Hostility | |
|---|---|---|---|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* | *B* | *SE* | *B* | *SE* |
| Mindfulness to aggression (*c* path) | -.22** | .07 | -.14* | .07 | -.34*** | .06 | -.51*** | .06 |
| Mindfulness to self-control (*a* path) | .40*** | .04 | .40*** | .04 | .40*** | .04 | .40*** | .04 |
| Self-control to aggression (*b* path) | -.26* | .10 | -.15 | .10 | -.20* | .09 | -.37*** | .08 |
| Mindfulness to aggression, via self-control (*c'* path) | -.12 | .08 | -.08 | .08 | -.26*** | .07 | -.36*** | .07 |
| Indirect path (*ab* path) | -.10[a] | .04 | -.06 | .05 | -.08[a] | .04 | -.14[a] | .04 |
| Bias-corrected bootstrap 95% confidence intervals | [-.19, -.03] | | [-.15, .03] | | [-.16, -.01] | | [-.22, -.08] | |

*Note. B* = unstandardised regression coefficient; *SE* = standard error.
[a] Zero is not included in the 95% confidence interval, indicating that the indirect path is significantly different from zero.
*$p < .05$; **$p < .01$; ***$p < .001$

When the analysis was repeated including the covariates (current educational status, sex, age, race/ethnicity, and current mindfulness practice), again no mediation model could proposed on verbal aggression (*b* path: *B* = -.15, *p* = .12). Self-control

continued to mediate the link between mindfulness and physical aggression (*B* = -.11, *SE* = .04, 95% CI [-.19, -.04]), hostility (*B* = -.09, *SE* = .03, 95% CI [-.16, .03]), and anger (*B* = -.09, *SE* = .04, 95% CI [-.18, -.03]). After the inclusion of self-control, mindfulness no longer predicted physical aggression (*B* dropped from -.14 to -.10, *p* = .20), but still predicted hostility (*B* dropped from -.41 to -.36, *p* < .0001) and anger (*B* barely changed from -.25, *p* < .001). These findings highlighted the mediating effect of self-control (on physical aggression, anger, and hostility) as well as the unique role of mindfulness (on anger and hostility) without controlling the covariates.

For clarity of presentation, the partial effects of covariates are presented separately (Table 2.4). Males scored higher in overt aggression, whereas Asian participants showed higher physical aggression and hostility. None of the hypothesised covariates influenced the levels of anger.

Table 2.4.
*Partial effect of control variables for mediation models with bootstrapping method, using mindfulness as predictor, self-control as mediator, aggression subscales as outcomes*

| Covariates | Physical aggression | | Verbal aggression | | Anger | | Hostility | |
|---|---|---|---|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* | *B* | *SE* | *B* | *SE* |
| Sex | -.49*** | .11 | -.26* | .11 | .13 | .10 | -.11 | .09 |
| Age | -.01 | .01 | -.01 | .01 | .01 | .01 | -.01 | .01 |
| Ethnicity | .20* | .10 | .17 | .10 | .17 | .09 | .19* | .09 |
| Current educational status | -.18 | .19 | -.13 | .19 | -.05 | .17 | -.24 | .17 |
| Current mindfulness practice | .07 | .08 | .10 | .08 | .12 | .08 | .05 | .07 |

*Note. B* = unstandardised regression coefficient; *SE* = standard error
*N* = 233 (listwise deletion)
*$p$ < .05; **$p$ < .01; ***$p$ < .001

### 2.4.6 Moderation of mindfulness on the link between self-control and aggression

To examine the moderating effect of mindfulness on the link between self-control and aggression (Hypothesis 4), a bootstrapping method (model number 1 in the "Process" macro for SPSS), with 95% bias-corrected confidence intervals was carried out. All predictors and proposed moderators were mean-centered.

#### 2.4.6.1 Trait aggression

Significant main effects of mindfulness ($c_2$: $B$ = -.20, $SE$ = .06, $p$ < .0001) and self-control ($c_1$: $B$ = -.24, $SE$ = .07, $p$ < .01) were found on general trait aggression. However, the interaction effect between mindfulness and self-control was not significant ($c_3$: $B$ = -.06, $SE$ = .07, $p$ = .46), with insignificant change in the total variance in aggression ($R^2$ = .20%). Thus Hypothesis 4 was not supported such that self-controlled individuals who were at the same time also mindful were no less aggressive then self-controlled individuals who were not mindful. Levels of general aggression were predicted separately by trait mindfulness and self-control.

#### 2.4.6.2 Aggression subscales

The moderation analysis was repeated for each of the four trait aggression subscales (Table 2.5). Overall, mindfulness did not moderate any relationships between self-control and the aggression subscales. Individuals who were more self-controlled were less physically aggressive and less hostile regardless their levels of mindfulness, whereas individuals who were more mindfulness showed less hostility and anger regardless of their levels of self-control.

Table 2.5.
*Moderation models with bootstrapping method, using self-control as predictor, mindfulness as moderator, aggression subscales as outcomes*

| Model tested | Physical aggression | | Verbal aggression | | Anger | | Hostility | |
|---|---|---|---|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* | *B* | *SE* | *B* | *SE* |
| Self-control ($c_1$) | -.26$^{*}$ | .10 | -.15 | .10 | -.19 | .09 | -.37$^{***}$ | .09 |
| Mindfulness ($c_2$) | -.12 | .08 | -.08 | .08 | -.26$^{***}$ | .07 | -.36$^{***}$ | .07 |
| Self-control x Mindfulness ($c_3$) | -.05 | .64 | -.12 | .10 | -.04 | .09 | -.02 | .09 |
| $R^2$ on interaction | .08%, $p$ = .65 | | .56%, $p$ = .24 | | .05%, $p$ = .70 | | .01%, $p$ = 83 | |

*Note.* $B$ = unstandardised regression coefficient; $SE$ = standard error; $R^2$ = variance increase
$^{*}p$ < .05; $^{**}p$ < .01; $^{***}p$ < .001

### 2.4.7 Link between self-harm and harm to others

Hypothesis 5 was tested by comparing self-harmers vs. non self-harmers in terms of their aggression levels. Those who self-harmed showed higher levels of general trait aggression ($t(239) = 2.78$, $p < .01$; *M* self-harmers = 2.76, *SD* = .64 vs. *M* non self-harmers = 2.47, *SD* = .64). In addition, differences between self-harmers and non-harmers were found for physical aggression ($t(239) = 3.58$, $p < .001$; *M* self-harmers = 2.58, *SD* = .95 vs. *M* non self-harmers = 2.10, *SD* = .80) and anger ($t(239) = 2.38$, $p < .05$; *M* self-harmers = 2.70, *SD* = .84 vs. *M* non self-harmers = 2.40, *SD* = .78). No differences were found in verbal aggression ($t(97) = 1.57$, $p = .12$; *M* self-harmers = 3.05, *SD* = .78 vs. *M* non self-harmers = 2.84, *SD* = .84) or hostility ($t(97) = 1.20$, $p = .23$; *M* self-harmers = 2.72, *SD* = .93 vs. *M* non self-harmers = 2.56, *SD* = .81).

### 2.4.8 Link between mindfulness, self-control, and self-harm

Provided that to some extent self-harm was positively related to aggression, we expected that the association between self-harm and mindfulness and self-control would mirror the association between these predictors and trait aggression (Hypothesis 6). As expected, self-harmers ($n = 49$) scored lower than non self-harmers ($n = 192$) in both trait mindfulness ($t(239) = 3.58$, $p < .001$; *M* self-harmers = 3.62, *SD* = .89 vs. *M* non self-harmers = 3.90, *SD* = .74) and self-control ($t(239) = 2.38$, $p < .05$; *M* self-harmers = 2.77, *SD* = .54 vs. *M* non self-harmers = 3.08, *SD* = .62).

Additionally, we assessed the role of anxiety (*M* = 1.17, *SD* = .58) and depression (*M* = .63, *SD* = .50) on self-harm. High internal validity was shown on both scales ($\alpha = .81$ for anxiety, and .79 for depression), and they were strongly related to each other ($r = .58$, $p < .01$). None of the participants reported levels of anxiety and depression beyond *normal* (*M* of total anxiety and depression range from 0 to 5.43). Self-harmers were significantly more anxious ($t(239) = 3.27$, $p < .001$; *M* self-harmers = 1.44, *SD* = .67 vs. *M* non self-harmers = 1.10, *SD* = .54). They did not report more depression than non self-harmers ($t(61.68) = 1.76$, $p = .08$; *M* self-harmers = .76, *SD* = .63 vs. *M* non self-harmers = .59, *SD* = .46).

### 2.4.9 Mediation of self-control on the link between mindfulness and self-harm

To further examine if the mediation model of self-control also applied on the link between mindfulness and self-harm, we carried out another bootstrapping method with the dichotomous self-harm variable (yes vs. no) as dependent variable. In previous analysis (see section 2.4.5.1), it was shown that mindfulness predicted self-control ($B$ = .39, $SE$ = .04, $p$ < .0001). Results for 95% bias corrected bootstrap confidence intervals confirmed the mediating role of self-control on the link between mindfulness and self-harm. Specifically, self-harm was predicted by mindfulness ($B$ = -.47, $SE$ = .21, Wald = 4.90, $p$ < .05) and self-control ($B$ = -.74, $SE$ = .31, Wald = 5.61, $p$ < .05). Self-control mediated the link between mindfulness and self-harm ($B$ = -.30, $SE$ = .13, 95% CI [-.58, -.05]), thus providing support for Hypothesis 7. The model explained between 4.4% (McFadden $R^2$ and Cox & Snell $R^2$) and 6.9% (Nagelkerke $R^2$) of the variance in self-harm status. Even though there was not enough evidence for a full mediation (i.e., regression coefficient was not reduced to zero), the direct effect of mindfulness was no longer significant ($B$ = -.20, $SE$ = .20, Wald = .65, $p$ = .42) when accounting for self-control. Thus Hypothesis 8a could not be supported because mindfulness did not account for significance variance in self-harm over self-control.

The mediation model of self-control became non-significant ($B$ = -.17, $SE$ = .11, 95% CI [-.40, .03]) when we controlled for anxiety and depression. Prediction in explaining the variance in self-harm status increased between 6.61% (Cox & Snell $R^2$) or 6.77% (McFadden $R^2$) and 10.39% (Nagelkerke $R^2$), in which self-harm was predicted by anxiety ($B$ = .83, $SE$ = .39, Wald = 4.64, $p$ < .05), but not by depression ($B$ = -.11, $SE$ = .40, Wald = .07, $p$ = .79). Again, mindfulness did not account for significant variance of self-harm over self-control and anxiety and depression ($B$ = .006, $SE$ = .26, Wald = .0005, $p$ = .98), thus no support was found for Hypothesis 8b.

When the analysis was repeated including the covariates (i.e., current educational status, sex, age, race/ethnicity, and current mindfulness practice; $N$ = 233), the predicting role of anxiety on self-harm fell just short of significance ($B$ = .77, $SE$ = .40, Wald = 3.61, $p$ = .06). Older participants were less likely to self-harmed ($B$ = -.09, $SE$ = .05, Wald = 3.89, $p$ < .05).

### 2.4.10 Moderation of mindfulness on the link between self-control and self-harm

Given that mindfulness did not provide incremental validity over self-control in predicting self-harm, it would be unlikely that mindfulness would act as a moderator between self-control and self-harm (Hypothesis 9). When we conducted a bootstrapping method with 95% bias-corrected confidence intervals, the moderation model was not significant, explaining only 4.90% (Cox & Snell $R^2$) or 4.97% (McFadden $R^2$) and 7.70% (Nagelkerke $R^2$) variance in self-harm status. Self-harm was only predicted by self-control ($c_1$: $B$ = -.78, $SE$ = .31, $p$ < .05). There were no significant main effect of mindfulness ($c_2$: $B$ = -.27, $SE$ = .25, $p$ = .28), and interaction effect between mindfulness and self-control ($c_3$: $B$ = -.43, $SE$ = .39, $p$ = .25). Thus Hypothesis 9 could not be supported. For self-controlled individuals, self-harm levels were the same regardless of mindfulness.

### 2.4.11 Link between SP and SF and aggression/self-harm

From the zero-order correlations (see Table 2.1), it can be seen that both sensitivity to provocations (SP) and frustrations (SF) were positively correlated to general trait aggression and the four aggression subscales ($p$ < .01). Differences between self-harmers and non self-harmers were also found in SF ($t$(239) = 2.13, $p$ < .05; $M$ self-harmers = 2.93, $SD$ = .76 vs. $M$ non self-harmers = 2.65, $SD$ = .83), but not SP ($t$(95.25) = 1.50, $p$ = .14; $M$ self-harmers = 3.08, $SD$ = .61 vs. $M$ non self-harmers = 2.92, $SD$ = .80). These findings provided a partial support for Hypothesis 10, such that individual differences in SP and SF were positively associated with trait aggression, but only SF was related to self-harm.

### 2.4.12 Moderation of mindfulness and self-control on the link between SP and SF and aggression/self-harm

The moderating role of mindfulness and self-control on the link between SP and SF and aggression (Hypothesis 11a) and self-harm (Hypothesis 11b) were tested using a

bootstrapping method with 95% bias-corrected confidence intervals for additive moderation (model "number 2" in the PROCESS macro). All predictors and proposed moderators were mean-centered.

#### 2.4.12.1 Trait aggression

No significant interaction effects were found between SP and self-control ($c_4$: $B$ = -.09, $SE$ = .08, $p$ = .27, $R^2$ = .36%) or between SP and mindfulness ($c_5$: $B$ = -.07, $SE$ = .05, $p$ = .22, $R^2$ = .44%) on general trait of aggression. There was a small but non-significant change in the total variance in aggression due to the inclusion of both moderators ($R^2$ = 1.48%, $p$ = .08). Trait aggression was predicted separately by SP ($c_1$: $B$ = .34, $SE$ = .05, $p$ < .0001), self-control ($c_2$: $B$ = -.14, $SE$ = .04, $p$ < .05), and mindfulness ($c_3$: $B$ = -.19, $SE$ = .05, $p$ < .001).

A very similar pattern of results occurred for sensitivity to frustrations (SF). No significant interaction effects emerged between SF and self-control ($c_4$: $B$ = .06, $SE$ = .08, $p$ = .46, $R^2$ = .17%), or between SF and mindfulness ($c_5$: $B$ = -.10, $SE$ = .06, $p$ = .09, $R^2$ = .89%). The change in the total variance in aggression due to the inclusion of both moderators was non-significant ($R^2$ = .89%, $p$ = .23). Trait aggression was again predicted separately by SF ($c_1$: $B$ = .30, $SE$ = .05, $p$ < .0001), self-control ($c_2$: $B$ = -.14, $SE$ = .07, $p$ < .05), and mindfulness ($c_3$: $B$ = -.15, $SE$ = .06, $p$ < .01).

Altogether, Hypothesis 11a could not be supported. Individuals who were higher in SP and SF but at the same time also mindful or self-controlled showed no less general propensity to behave aggressively than those who were also higher SP and SF individuals but were not mindful or self-controlled.

#### 2.4.12.2 Aggression subscales

The moderation analysis was repeated for aggression subscales (Table 2.6 and 2.7). The moderation of mindfulness on the link between SP and anger ($B$ = -.15, $SE$ = .08, $p$ < .05, $R^2$ = 1.26%), and SF and hostility (B = .06, $SE$ = .08, $p$ = .46, $R^2$ = .17%) was

confirmed. Specifically, individuals who were more sensitive to provocations but at the same time were mindful reported less anger. Those who were more sensitive to frustrations but at the same time were mindful were less hostile.

Table 2.6.
*Moderation models with bootstrapping method, using sensitivity to provocations (SP) as predictor, mindfulness and self-control as moderators, and aggression subscales as outcomes*

| Model tested | Physical aggression | Verbal aggression | Anger | Hostility |
|---|---|---|---|---|
| | *B* (*SE*); $R^2$ | *B* (*SE*); $R^2$ | *B* (*SE*); $R^2$ | *B* (*SE*); $R^2$ |
| Self-control ($c_2$) | -.16 (.10) | -.05 (.10) | -.11 (.09) | -.25** (.08) |
| SP ($c_1$) | .32*** (.07) | .30*** (.07) | .34*** (.06) | .38*** (.06) |
| SP x Self-control ($c_4$) | -.08 (.12); .17% | -.13 (.12); .44% | -.03 (.10); .03% | -.12 (.10); .38% |
| Mindfulness (c3) | -.10 (.08) | -.07 (.08) | -.23*** (.07) | -.34*** (.07) |
| SP x Mindfulness ($c_5$) | -.04 (.08); .07% | -.002 (.08); .00% | -.15 (.08)*; 1.26% | -.10 (.07); .50% |
| $R^2$ on both interactions | .44%, *p* = .55 | .57%, *p* = .48 | 1.88%, *p* = .06 | 1.63%* |

*Note. B* = unstandardised regression coefficient; *SE* = standard error; $R^2$ = variance increase
*$p$ < .05; **$p$ < .01; ***$p$ < .001

Table 2.7.
*Moderation models with bootstrapping method, using sensitivity to frustrations (SF) as predictor, mindfulness and self-control as moderators, and aggression subscales as outcomes*

| Model tested | Physical aggression | Verbal aggression | Anger | Hostility |
|---|---|---|---|---|
| | *B* (*SE*); $R^2$ | *B* (*SE*); $R^2$ | *B* (*SE*); $R^2$ | *B* (*SE*); $R^2$ |
| Self-control ($c_2$) | -.18 (.10) | -.07 (.10) | -.07 (.09) | -.26** (.08) |
| SF ($c_1$) | .23*** (.06) | .24*** (.07) | .37*** (.06) | .34*** (.06) |
| SF x Self-control ($c_4$) | -.01 (.12); .00% | -.09 (.12); .24% | -.05 (.10); .06% | -.10 (.10); .38% |
| Mindfulness (c3) | -.08 (.08) | -.04 (.08) | -.19** (.07) | -.30*** (.07) |
| SF x Mindfulness ($c_5$) | -.08 (.08); .38% | -.05 (.08); .15% | -.12 (.07); .89% | -.14* (.07); 1.07% |
| $R^2$ on both interactions | .45%, *p* = .55 | .28%, *p* = .70 | .92%, *p* = .23 | 1.08% |

*Note. B* = unstandardised regression coefficient; *SE* = standard error; $R^2$ = variance increase
*$p$ < .05; **$p$ < .01; ***$p$ < .001

#### 2.4.12.3 Self-harm

We repeated the moderation analysis using dichotomised self-harm variable as the outcome. For SP, no significant interaction effects were found between SP and self-control ($c_4$: *B* = .32, *SE* = .44, *p* = .47), or between SP and mindfulness ($c_5$: *B* = -.18, *SE*

= .31, $p$ = .56). The moderation model only explained between 4.90% (Cox & Snell $R^2$) or 4.97% (McFadden $R^2$) and 7.70% (Nagelkerke $R^2$) variance in self-harm status. Self-harm was solely predicted by self-control ($c_2$: $B$ = -.77, $SE$ = .32, $p$ < .05), but neither by SP ($c_1$: $B$ = .10, $SE$ = .23, $p$ = .66) nor mindfulness ($c_3$: $B$ = -.15, $SE$ = .26, $p$ = .56).

The proposed moderation model for SF revealed exactly the same pattern, such that no significant interaction between SF and self-control ($c_4$: $B$ = .27, $SE$ = .43, $p$ = .52), or between SF and mindfulness ($c_5$: $B$ = -.22, $SE$ = .29, $p$ = .46). The model explained between 5.16% (Cox & Snell $R^2$) or 5.24% (McFadden $R^2$) and 8.11% (Nagelkerke $R^2$) variance in self-harm status. Here again, self-harm was only predicted by self-control ($c_2$: $B$ = -.70, $SE$ = .32, $p$ < .05), but not by SF ($c_1$: $B$ = .27, $SE$ = .23, $p$ = .24), or mindfulness ($c_3$: $B$ = -.11, $SE$ = .26, $p$ = .69).

Overall no support was found for Hypothesis 11b, in that only higher self-control individuals would be less self-harmed, regardless their levels of SP, SF, or mindfulness.

## 2.5 DISCUSSION

### 2.5.1 Relationships between mindfulness, self-control, and aggression

The primary purpose of the current study was to investigate the dynamic of interaction between individual differences in mindfulness, self-control, and aggression. The plausible interaction was explored by examining two different perspectives, whether (i) self-control mediated any relationships between mindfulness and trait aggression (ii) mindfulness accounted for incremental validity over self-control in predicting trait aggression, and therefore might moderate any relationships between self-control and aggression. Preliminary analysis indicated that mindfulness was associated with reduced trait aggression, and that higher levels of mindfulness were strongly associated with higher levels of self-control. However, the strengths of the predictions of mindfulness and self-control on the aggression measures were varied.

The proposed mediation of self-control on the link between mindfulness and general trait aggression was supported in the current study, even after controlling for relevant demographic factors (i.e., current educational status, sex, age, race/ethnicity, and current mindfulness practice). This finding provides empirical evidence that self-control may be the potential mechanism by which mindfulness reduces aggression. Further examination of the proposed mediation model on the four aggression subscales revealed that self-control mediated the impact of mindfulness on physical aggression, anger, and hostility, but not on verbal aggression. Verbal aggression appears to be more related to sex (i.e., higher levels of verbal aggression amongst male participants).

Recently, to demonstrate the incremental validity of mindfulness over self-control on psychological functioning, Bowlin and Baer (2012) used hierarchical regression analyses, in which trait self-control (Tangney et al.'s SCS, 2004) was entered prior to trait mindfulness (as measured by the FFMQ: Baer et al., 2006) at the regression steps. With this approach, significant variance of mindfulness would be established if the total variance of the outcome increases after the inclusion of mindfulness. Comparable results were obtained when we rerun the analysis following the Bowlin and Baer's (2012) analysis (Note that in the current study, the unique contribution of mindfulness was estimated directly with bootstrapping method, through the *c'* path [the direct effect of mindfulness on aggression]). Specifically, mindfulness showed incremental validity over self-control in predicting trait aggression, anger, and hostility, but not physical aggression. This finding highlights the unique role of mindfulness in the emotional or affective component of aggression (i.e., anger) as well as the cognitive one (i.e., hostility). The impact of mindfulness on physical aggression, however, appears to be largely attributable to self-control mechanism. As a comparison, one correlational study (Borders et al., 2010) found no support for the mediating role of rumination on the link between mindfulness and physical aggression, even though rumination mediated the link between mindfulness and verbal aggression, anger, and hostility. Altogether, self-control may be the primary mechanism through which mindfulness influences physical aggression.

Given that mindfulness accounted for significant variance in some of the aggression measures after the inclusion of self-control, it was reasonable to expect that mindfulness might moderate the link between self-control and aggression. No support was found for the proposed moderation models, either on general trait aggression or on any of the four trait aggression subscales. Higher self-controlled individuals would be less physically aggressive and less hostile regardless of their levels of mindfulness, whereas more mindful individuals would be less angry and hostile despite their self-control levels. This inconclusive pattern of results implicates the necessity to directly compare the effect of mindfulness and self-control through experimental studies, while controlling for individual differences in aggression. To this end, studies reported in chapters 3, 4, and 5 of the current thesis do just this, comparing the impact of induction in mindfulness vs. training in self-control on aggressive behaviour (Chapter 3) and the moderating effect of mindfulness on aggressive behaviour following self-control depletion (Chapter 4 and 5).

No differences were found either in mindfulness or self-control as a function of current mindfulness experience. It is possible that these non-significant correlations were due to the characteristics of our sample. In the original study of the Mindfulness Attention Awareness Scale (MAAS), Brown and Ryan (2003) recruited meditation practitioners a Zen monastery, finding significant relationships between the MAAS and experience with meditation. Compared to Brown and Ryan's sample, our meditation sample reported much lower MAAS scores ($M$ = 3.65, $SD$ = .91 vs. $M$ = 4.38, $SD$ = .65 in our sample and the development scale sample, respectively). Additionally, Brown and Ryan's sample was also much older ($M$ age = 41.08, range 22 – 62 years) than our sample ($M$ age = 23.87, range 18 – 41), which may be a relevant factor, as age showed positive correlation with trait mindfulness and self-control in the current study. A recent validation study of the MAAS also suggested for "caution in presuming experience with meditation is associated with greater mindfulness *in a general sample*" (MacKillop & Anderson, 2007, p.292).

Interestingly, current mindfulness experience was inversely associated with trait aggression and verbal aggression. One possible explanation is that those who have undertaken mindfulness meditation might have done so in order to deal with some

negative emotions or similar psychological distresses, including anger and aggression. While mindfulness practice may have helped them by reducing their aggression levels, we have no data to assess their levels of aggression before and after they engaged in such practice. Experimental studies could help address this possibility by examining the differences in aggression between those who have received mindfulness training compared to those who have not. It should also be noted that although we have provided a clear definition of *mindfulness experience* in the survey (i.e., "a specific meditational practice in directing attention without making any judgment"), participants were only asked to rate the amount of time of their current practice (i.e., daily, weekly, monthly, once in a year). Other crucial indicators may have been overlooked, such as the duration of the practice history, or the extent to which they perceived that the practice was employed into daily life (Brown &Ryan, 2003). In addition, is also plausible that the unequal sample size (11.2% vs. 88.8% for "experienced" and no experience groups, respectively) may have compromised the conclusions we obtained.

Higher levels of trait aggression and anger were also reported by Asian participants compared to White participants, whereas no ethnic differences were found in overt aggression. This finding appears to contradict literature on the influence of cultural values on aggression. Asian cultures are typically associated with collectivism values, which emphasise the maintenance of social harmony and conflict avoidance, therefore should display less tendency to aggress than societies with stronger individualistic values (e.g., Forbes et al., 2009; Li et al., 2010; Magnis-Suseno, 1997). Nevertheless, our data were obtained online from anonymous participants. It is unclear whether those who classified as Asian would in reality adopt the collectivistic or individualistic values (e.g., some might have been born and raised within Western cultures). Hence a further cross-cultural comparison is warranted (see Chapter 6).

### 2.5.2 Link between aggression, mindfulness, self-control, and self-harm

Additionally, the current study aimed to examine if trait mindfulness and self-control could predict individuals' tendency to harm themselves in the same way as they may

predict harm to others. Our preliminary analysis supported that self-harm was positively correlated to trait aggression, physical aggression, and anger, but not to verbal aggression and hostility.

The lack of significant correlation between self-harm and hostility requires further elaboration. Hostility towards others (as assessed with Buss & Warren's Aggression Questionnaire [BWAQ]: 2000) was reported as predicting the common categories of suicidal behaviours (i.e., suicidal ideation, suicide plan, and suicide attempts) amongst Chinese adolescents (Zhang, Roberts, Liu, Meng, Tang et al., 2012). Participants in our study were asked to rate their self-harming behaviour in the *absence* of suicidal intent only. It is plausible that the absence of this intention might have reduced the expected association between self-harm and hostility towards others, at least in the current sample. Measures of self-harm in the *presence* of suicidal intent are noteworthy to clarify the association between self-harm and aggression, particularly in terms of hostility.

Crucially, the current study found that self-control mediated the link between mindfulness and self-harm in the same way as it mediated the relationship between mindfulness and aggression. Thus information about individuals engagement in self-harm may be useful for experimental work investigating the role of mindfulness and self-control on aggressive behaviour.

It is particularly interesting, however, that after the inclusion of self-control, mindfulness was no longer a significant predictor for self-harm. Likewise, mindfulness did not moderate the link between self-harm and self-control. A similar result was found in Slee, Spinhoven, et al.'s (2008) study using clinical population, in which the effect of treatment on self-harming behaviour was mediated by self-control related components (as measured by the Difficulties in Emotion Regulation Questionnaire [DERS]: Gratz & Roemer, 2004), but not so much by the mindfulness-related components (i.e., the awareness of and acceptance of negative emotions in the DERS). Taken together, these finding appear to support that reduction in self-harming behaviour occurs primarily through the mechanism of self-controlled emotion regulation.

It should also be noted that in the current sample, only anxiety but not depression predicted self-harm. Both variables have been described as the most common factors of self-harm (e.g., Hawton et al., 2002). The non-significant correlation between depression and self-harm may have resulted from low levels of depression in the current sample (*M* depression = .63, *SD* = .50; *M* anxiety = 1.17, *SD* = .58). In addition, depression levels of self-harmers were not significantly different from non self-harmers. The presence of a floor effect could interfere with the identification of any existing relationships. Replication with a different population is necessary to help resolve this issue.

### 2.5.3 Role of individual differences in SP and SF

For a more comprehensive understanding of the predictions of aggression, the current study explored the potential role of individual differences in sensitivity to provocations (SP) and frustrations (SF). Results showed that both SP and SF were positively associated with trait aggression and the four aggression subscales. Importantly, mindfulness decreased the likelihood of anger amongst individuals who were more sensitive to provocations and of hostility amongst those who were more sensitive to frustrations. Conversely, self-control did not moderate any relationships between SP and SF and overt or overall aggression. These findings strengthen the unique role of mindfulness on anger and hostility, independent and beyond the mechanism of self-control. The mindful awareness and acceptance of negative emotions appear to work in particular by reducing the physiological arousal and preparation for aggression (i.e., anger) when individuals are provoked, and by lessening the feeling of ill will and injustice (i.e., hostility) when individuals are trigged with frustrations.

The correlation between SP and SF and self-harm did not mirror the association between these variables and aggression. Specifically, only SF was related to self-harm. This suggests that SF may be a pertinent individual difference when predicting self harm *and* aggression, while SP may be more specifically related to aggression. Individuals may engage in self-harmful behaviour while dealing with situations

where they experienced a lack of control, but not when being provoked. Further, moderator analysis with mindfulness and self-control revealed that self-control predicted self-harm beyond the possible influence of SP, SF, and mindfulness. This latter finding reiterated that self-controlled emotion regulation plays a major role in attenuating self-harming behaviour.

### 2.5.4 Strengths and limitations of the current study

In the current study, all measures were self-reported and so potentially are influenced by social desirability. To anticipate this issue, participants were told explicitly that the study focused on how individual differences in the measures were related to each other, not on individual profile of each participant. Moreover, instead of counterbalancing the order of the questionnaires, we tried to minimise participants' barrier by presenting more sensitive measures (aggression followed by self-harm) at the end of the survey.

A further concern is the nature of data collection. Specifically, our data were collected online using a surveymonkey website. Despite the recommendations that internet and traditional survey data are comparable in terms of the problems they may impose (Gosling, Vazire, Srivastava, & John, 2004; see also Kraut et al., 2004), one of the significant drawbacks of the internet sampling is that some participants might want to increase their chances of winning the prize draw by entering the survey multiple times. To anticipate this issue, at the end of the survey we asked participants to enter some "security details" (i.e., the first letter of their hometown, the last letter of their most favourite colour, the initial of their mothers' maiden name, the month they were born in, and the number of siblings they have), rather than imposing them to provide their email addresses or to use computers with different IP addresses.

Importantly, our main analyses relied on the bootstrapping method (Preacher & A. F. Hayes, 2004, 2008) to test the proposed mediation and moderation models. Even though bootstrapping method is superior in terms of power and Type I error rates

compared to the traditional causal approach or Sobel test (see e.g., MacKinnon et al., 2004; Shrout & Bolger, 2002), non-experimental data can only suggest that a proposed mediation pattern is plausible. While our hypotheses were mostly derived from the proposal that self-control is more likely to be acquired from practicing mindfulness mode of awareness (e.g., Bishop et al., 2004; Brown et al., 2007a; Shapiro et al., 2006), the opposite mechanism cannot be completely ruled out. Specifically, self-control may actually predict mindfulness—as proposed in Masicampo and Baumeister's (2007) theoretical work—and in turn mindfulness predicts aggression. Fully experimental studies of causal process are of particular necessary for mediation and moderation testing (see e.g., MacKinnon et al., 2002).

Despite the limitations, the current study provides preliminary evidence that mindfulness might reduce aggression and self-harm through its influence on self-control. The inclusion of measure of individual differences in SP and SF may also provide a more comprehensive understanding about the usefulness of mindfulness and self-control for the reductions of aggression and self-harm.

### 2.5.5 Conclusions and next steps

Our result suggested that both trait mindfulness and trait self-control may reduce the general individual propensity to behave aggressively to themselves and to others. Crucially, trait mindfulness may *uniquely* reduce anger and hostility regardless of individual's level of self-control, SP, and SF. By contrast, self-control appears to be the primary mechanism through which mindfulness may influence *physical aggression* and self-harm. In the following chapters, we will report three experimental studies of mindfulness and self-control on aggressive *behaviour* in a fully-controlled experimental design. In this way, the difficulties of interpreting cross-sectional data with mediation analyses are minimised, and it is possible to make some causal conclusions about the relationship between mindfulness, self control, and aggressive behaviour. For homogeneity and ease of accessibility purposes, only university students would be recruited as our next population.

# CHAPTER THREE

# Study 2: Effect of mindfulness induction and self-control training on aggressive behaviour

## 3.1 INTRODUCTION

The results in Study 1 (Chapter 2) supported that individual differences in mindfulness and self-control may reduce the propensity to behave aggressively. Mindfulness also showed incremental validity over self-control in predicting trait aggression, anger, and hostility. However, the impact of mindfulness on self-reported *physical aggression* was largely attributable to self-control. Accordingly, the current study has two major purposes. Firstly, to investigate whether experimentally inducing state of mindfulness would reduce *aggressive behaviour*. Secondly, to explore whether mindfulness induction could strenghten the potential reduction of aggressive behaviour due to increases in self-control strength (i.e., following self-control training). In addition, the potential roles of individual differences in self-harm as well as in sensitivity to provocations (SP) and frustrations (SF) are also assessed.

### 3.1.1 Mindfulness induction and aggressive behaviour

The first aim of the current study is to examine whether reductions in *aggressive behaviour* could occur by experimentally manipulating individuals' levels of mindfulness, using a 10-min of mindful walking exercise (Kabat-Zinn, 1994; Sujiva, 2000). Given that mindfulness is generally studied as a dispositional form and as a result of therapeutic interventions, most aggression literature has also explored the role of mindfulness in these contexts. As previously discussed, trait mindfulness was shown to be related to various self-reported measures of aggression (e.g., Barnes et al., 2007; Borders et al., 2010; Brown & Ryan, 2003; Kelly & Lambert, 2012). Our results from Study 1 also found negative relationship between trait mindfulness and trait aggression, physical and verbal aggression, anger, and hostility. In mental health

and forensic settings, several authors have recommended the potential applications for mindfulness-based treatment of aggression and anger (see Howells, 2010; Howells et al., 2010; Wright et al., 2009; also Singh and colleagues series of case studies, 2003, 2007, 2011).

More recently, the benefit of mindfulness on emotion-related processes is proposed to be observed through brief laboratory inductions, using a short guided meditation instruction to adopt an accepting attitude toward one's experiences (for a review, see Keng et al., 2011). In this context, however, only one reported aggression study (Heppner et al., 2008) actively manipulated participants' state of mindfulness (using a raisin eating task), providing a preliminary support for the potential effect of state mindfulness on aggressive behaviour (a description of this study is provided in section 1.2.2.4, Chapter 1). As in Heppner et al.'s study, our current study employs the same measure of aggressive behaviour called the Taylor Competitive Reaction Time (TCRT: Taylor, 1967) task, specifically in its adapted form.

In typical work using the TCRT task, participants play a computer-based competitive reaction-time task against a bogus partner, where the winner of each trial is given opportunity to deliver a noise blast/electric shock to the loser. In the adapted version of the TCRT task, a non-aggressive option is provided for the participants (e.g., De Wall, Buckner, Lambert, Cohen, & Fincham, 2010; Konrath, Bushman & Campbell, 2006; Muller, Bushman, Subra, & Ceaux, 2012; for critics on the importance of providing non-aggressive response options, see Ritter & Eslea, 2005; Tedeschi & Quigley, 1996). Following past research (Anderson, Buckley, & Carnagey, 2008; Lawrence & Hutchinson, 2013a, 2013b), we use participant's *intensity of the noise blasts* to the bogus opponent as a main measure of *direct aggression*.

Bettencourt, Talley, Benjamin, and Valentine's (2006) meta-analytic review concludes that the influence of personality variables on aggressive behaviour may differ under provoking and nonprovoking conditions. This indicates the necessity for the current study to distinguish the proposed effect of mindfulness induction on provoked and unprovoked aggression, and account for the potential role of individual differences (trait mindfulness, self-control, aggression, self-harm, SP, and

SF). While higher blast intensities are commonly associated with increased levels of provocation, interventions aimed at reducing aggression in the TCRT task tend to lose their effectiveness under high provocations (see Lawrence & Hutchinson, 2013a, 2013b). Thus instead of using a social rejection task in Hepper et al.'s (2008) study to provoke aggression, we vary the levels of provocation in the TCRT task, such that participants are exposed to no provocation, low provocation, and high provocation trials. By doing so, it is possible to see whether any impact of mindfulness induction would persist despite opponents' increases in levels of provocation.

As concluded by Giancola and Parrot (2008), it is more likely for people to engage in implicit aggression (represented by shock *duration* in the TCRT task) than explicit aggressions (shock *intensity*) when their aggressive impulses are inhibited by other factors, such as cultural values and sex role norms. In the current study, we include measure of the *maximum latency* (the delay duration before the maximum blast was delivered the opponent in the TCRT task; see Lawrence & Hutchinson, 2013a, 2013b), which is arguably similar to shock duration in its more subtle form of aggression. In this way, the potential influence of mindfulness induction on different types of aggression can be explored.

We also assess aggressive behaviour in terms of *indirect aggression*, specifically through participants' anonymous reputation damage of the opponent. A negative judgment would reflect an immediate intent to cause harm to the target, which corresponds to Bushman and Anderson's (2001) widely accepted definition of aggression. A similar method has been used as a sole measure of aggressive behaviour in many previous studies (e.g., De Wall et al., 2007; Stucke & Baumeister, 2006; Twenge, Baumeister, Tice, & Stucke, 2001). While higher levels of direct aggression in the TCRT task have been demonstrated in males than in females (Giancola & Parrott, 2008), sex differences in aggression typically narrows when indirect aggression is measured (see Card, Stucky, Sawalani, & Little, 2008).

In addition, the current study examines the proposed effect of mindfulness induction on a behavioural measure of *self-control performance* as an additional dependent variable beyond aggressive behaviour. Specifically, we use performance in a

handgrip task that has been identified as one of the frequently used dependent task in Hagger's et al. (2010) meta-analysis. We expect that the immediate effect of mindfulness induction on self-control performance would be sustained after participants have engaged in a provocation procedure.

### 3.1.2 Self-control training and aggressive behaviour

In a validity study of the Taylor paradigm, Giancola and Parrott (2008) demonstrated that *direct aggression* during the TCRT task were mostly associated with trait physical aggression (assessed using Buss & Perry's AQ, 1992). Results in Study 1 revealed the influence of trait mindfulness on self-reported aggression, physical aggression, anger, and hostility was mediated by trait self-control. After the inclusion of trait self-control, however, the predicting role of trait mindfulness on physical aggression was no longer significant). It is particularly crucial, therefore, to determine whether the effect of state induced mindfulness on *aggressive behaviour* could indeed be separated from the effect of self-control. The next aim of the current study is to test whether (i) increasing self-control strength reduces aggressive behaviour in the same way it could be reduced by mindfulness induction, and (ii) the potential reduction of aggressive behaviour due to increases in self-control strength could be strenghtened by mindfulness induction.

As introduced in Chapter 1 (section 1.2.3.2), the majority of self-control experiments appear to fall under the strength model of self-control advocated by Baumeister and colleagues (see Hagger et al.'s meta-analysis, 2010). Here, different acts of self-control are proposed to draw from a common, general "resource" (Baumeister, Vohs, et al., 2007). Performing self-control acts may temporarily deplete this resource (this phenomenon will be investigated in the subsequent studies of this thesis). Conversely, *regular* practice of self-control over extended periods can *improve* the general capacity for self-control.

Outside the area of aggression, the effects of various self-control training (e.g., improving posture, tracking eating habit, using nondominant hand in a mundane

task, avoiding colloquialisms/cursing) is usually demonstrated in the form of increases in *stamina* or a greater resistance to ego-depletion (e.g., Muraven et al., 1999; Gailliot et al., 2007; Oaten & Cheng, 2006a, 2006b, 2007). That is, individuals' performance on a self-control task following ego-depleting task is measured twice, at baseline level and after a period of training in a typically *unrelated* self-control task. The effect of self-control training is assessed by comparing the degree of *impairment* in self-control performance following depletion between self-control trained and non trained individuals at both time points (see Baumeister et al.'s, 2006, review).

More recently, Muraven (2010) found that individuals who practiced self-control (i.e., avoiding sweets or squeezing a handgrip) for two weeks showed significant *improvement* in self-control performance (i.e., a stop signal task) compared to those who practiced tasks that did not require self-control (i.e., solving math problems or keeping a diary of any self-control acts they engaged in). Thus consistent with the ways that muscular strength can be improved, increases in self-control strength could also occur in terms of self-control *power*. The current study employs self-control training of regulating posture for a period of two weeks (Muraven et al., 1999), and examines the effect of this training on self-control power in a handgrip task. We expect that self-control training participants would show a better handgrip power compared to non training participants.

Importantly, the effect of self-control training is also tested on aggressive behaviour. Corresponding with the view that self-control serves to restrain aggressive impulses (see Denson et al., 2012; DeWall et al., 2011), training in self-control has been shown to decrease aggression, particularly following provocation. Denson et al. (2011) found that a two-week training in physical regulation (using nondominant hand in mundane tasks) reduced direct aggression in the TCRT task (i.e., the mean score of blast intensity and duration) in response to insulting feedback from a bogus opponent, but only amongst individuals who scored higher in trait physical aggression (for details see section 1.2.3.3, Chapter 1). The same physical training, and a verbal regulation training of avoiding colloquialisms were used in Finkel et al.'s (2009) study involving a hypothetical scenario of provocations from an intimate partner. Specifically, all participants were asked to perform an ego-depleting task

(i.e., attention control task) before they completed a self-reported measure of violent inclinations towards a provoking partner—at baseline level and after performing self-control training. As predicted, self-control trained participants showed less violent inclination over time whereas no reductions were found in non self-control trained participants.

As mentioned in the earlier section, the current study adds a no-provocation condition, thus the impact of self-control training can be measured on both provoked and unprovoked aggression. In addition, self-control training is expected to influence other dependent measures, i.e., the maximum blast latency, rating of indirect aggression, and self-control performance in the same way these measures are proposed to be influenced by mindfulness induction. Moreover, we expect that mindfulness induction could strengthen the effect of self-control training on aggressive behaviour and self-control performance.

Since Study 1 found that trait mindfulness and self-control reduced individuals' tendency to harm themselves in a similar way as they predicted measures of trait aggression (section 2.4.8 and 2.4.9 in Chapter 2), the impact of mindfulness induction and self-control training could also be influenced by self-harm status. The impact of these manipulations may also be affected by individual differences in sensitivity to provocations (SP) and frustrations (SF). In the adapted TCRT task, individual differences in SP has been shown to be positively related to blast intensity following provoked aggression and to the maximum blast latency, but not to indirect aggression (Lawrence & Hutchinson, 20013b). Thus measures of individual differences in mindfulness, self-control, aggression, SP, SF, and self-harm are also assessed in the current study, along with relevant demographic factors, i.e., sex, race/ethnicity, and participants' current practice of mindfulness.

## 3.2 HYPOTHESES

The primary hypotheses of this study are concerned with the role of mindfulness induction and self-control training on aggressive behaviour, and predict that:

1. Compared to those not receiving mindfulness induction, participants receiving mindfulness induction will:
    a. Deliver lower levels of blast intensity to the opponent, particularly on low provocation trials. No strong prediction is made regarding the levels of blasts delivered under no provocation or high provocation trials.
    b. Wait longer before delivering the maximum blasts to the opponent.
    c. Deliver lower ratings of anonymous reputation damage to the opponent.
2. Those who receive self-control training will be less aggressive than those without self-control training, thus mirroring the associations with mindfulness induction (Hypothesis 2a – 2c).
3. Mindfulness induction will strengthen the effect of self-control training on aggressive behaviour. Specifically, compared to self-control training participants with no mindfulness induction, self-control training participants who also receive mindfulness induction will:
    a. Deliver lower levels of blast intensity to the opponent, particularly on low provocation trials. No strong prediction is made under no provocation or high provocation trials.
    b. Wait longer before delivering the maximum blasts to the opponent.
    c. Deliver lower ratings of anonymous reputation damage to the opponent.
4. The moderation of mindfulness on the link between self-control training and aggressive behaviour will persist after accounting for the potential influence of individual differences in mindfulness, self-control, aggression (i.e., trait aggression, sensitivity to provocations [SP] and frustrations [SF]), sex, self-harm, ethnicity/culture, and current mindfulness practice.

In addition, we predict that:

5. Mindfulness induction will strengthen the effect of self-control training on self-control performance, as measured by handgrip power after accounting for trait and demographic covariates.

As a whole, we hypothesise that self-control training and mindfulness induction will predict lower levels of aggression and a better self-control (handgrip) performance, after accounting for covariates (personality variables). Moreover, mindfulness induction will strengthen the effect of self-control training on aggression.

## 3.3 METHODS

### 3.3.1 Participants

University of Nottingham students took part in two times points of the current study. A total of 147 (72 females) students entered Time 1 of the study. Based on sex, participants were randomly assigned to one of four groups (see randomisation details in the next section). Data were removed from further analyses due to: not attending the Time 2 session (*n* = 19 from the self-control training condition and *n* = 18 from the no training condition), not providing any compliance scores to the self-control training (4 participants), and expressing spontaneous suspicions regarding the TCRT task (7 participants). Our final sample consisted of 99 participants (51 females). Participants' mean age was 20.02 (*SD* = 2.66). The ethnic distribution was 61.6% White, 29.3% Asian, 7.1% participants rated themselves as "Others", and 2.0% did not report their ethnical background. Concerning current mindfulness practice, 91.9% participants reported never having encountered mindfulness, 3.0% practised them on a monthly basis, 4.0% on weekly basis, and 1% (1 participant) practised them on daily basis. The experiment lasted from October until November 2011.

### 3.3.2 Design

To these ends, we conducted a 2 (self-control training vs. no self-control training) x 2 (mindfulness induction vs. relaxation) experimental design (See Figure 3.1 for the flow of participants). Stratified sampling technique was employed to assess the effect of sex, as sex differences in aggression are prevalent in studies using the TCRT tasks (e.g., Anderson et al., 2008; Giancola & Parrott, 2008).

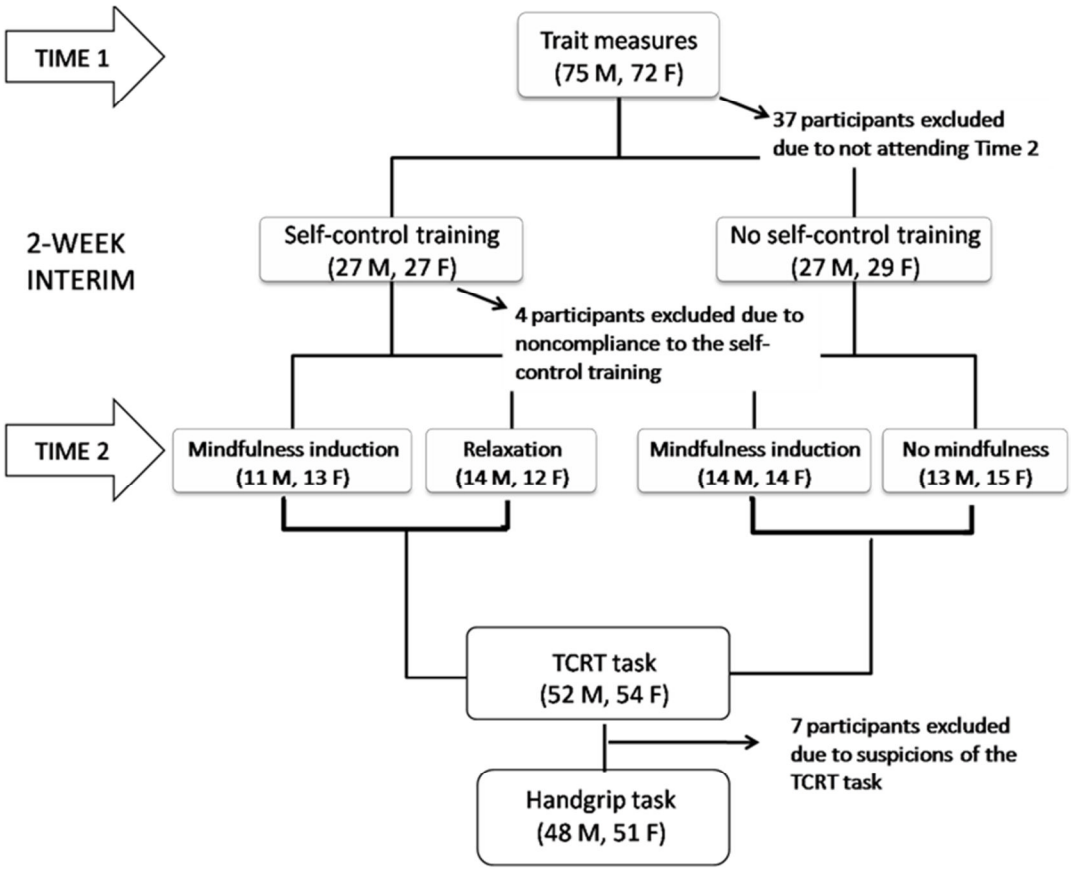


Figure 3.1. Flow of participants through Study 2.
*Note*. M = Males; F = Females

### 3.3.3 Trait and state measures

At Time 1 of the current study, participants were asked to complete the self-reported measures in Study 1 (Appendix 2.1, the full description of the trait measures can be found in section 2.3.3, Chapter 2). Specifically, we assess individual differences in mindfulness (Mindfulness Attention Awareness Scale [MAAS]: Brown & Ryan, 2003), self-control (Self-Control Scale [SCS]: Tangney et al., 2004), aggression (Aggression Questionnaire [AQ]: Buss & Perry, 1992), sensitivity to frustrations and provocations (Situational Triggers of Aggressive Responses [STAR scale]: Lawrence, 2006), and self-harm (Deliberate Self-Harm Inventory [DSHI]: Gratz, 2001).

The measure of anxiety and depression (Hospital Anxiety and Depression [HADS]: Zigmond & Snaith, 1983]) from Study 1 was replaced with a mood measure (Positive Affect, Negative Affect Schedule [PANAS]: Watson, Clark & Tellegen, 1988). The PANAS consists of two 10-item mood scales measuring *positive affect* (10 items, e.g.,

"interested", "distress") and *negative affect* (10 items, e.g., "irritable", "ashamed"). Participants were asked to rate on a 5-point scale (1 = *very slightly or not at all* and 5 extremely) the extent to which they experienced each mood state (Appendix 3.1). It is important to employ this measure following the TCRT task, since negative affect due to unpleasant experiences often trigger aggressive behaviours (Anderson & Bushman, 2002; Berkowitz, 1993, 2008).

The efficacy of the mindfulness intervention was assessed using Toronto Mindfulness Scale (TMS: Lau et al., 2006; see also Appendix 3.1). The TMS is based on Bishop et al.'s (2004) *two-component* model of mindfulness. It consists of 13 items assessing *curiosity* (6 items, e.g., "I was curious to see what my mind was up to from moment to moment") and *decentering* (7 items, e.g., ''I was more concerned with being open to my experiences than controlling or changing them.''), on a 5-point Likert-scale (0 = *not at all* and 4 = *very much*). Curiosity refers to the awareness of present experience with a quality of curiosity, while decentering refers to the awareness of one's experience with some distance and disidentification rather than being carried away by one's thoughts and feelings (Lau et al., 2006). Currently, the TMS is the only scale measuring mindfulness as a state (Bergomi, Tschacher, & Kupper, 2012; Sauer et al., 2013; see Feldman, Greeson & Senville, 2010; Ortner, Kilner, & Zelazo, 2007; Thompson & Waltz, 2007 for laboratory work using the TMS).

For the self-control trained group, we asked participants to rate how frequently they comply with the instruction of maintaining good posture (e.g., sit up straight, walk erectly, etc.) at all time, on a 6 point Likert-scale (1 = *almost never* and 6 = *almost always*). The mean score of compliance rating in two weeks period of training was used to determine participants' successfulness in following the instruction.

### 3.3.4 Experimental manipulations

#### 3.3.4.1 Self-control training

Those allocated to self-control training were instructed to perform a two-week task of improving posture. Specifically, participants were asked to monitor and correct

their postures (e.g., sit up straight, walk erectly, etc.) at all times. They were told that in order to gain the benefit of an improved posture, it is crucial for them to exert as much control as possible. Daily remainders for this group were sent via email, along with a single question about how compliant they were with the training (Appendix 3.2). They were given alternatives to reply to the emails with their compliance score on a daily basis, or to hand in the print out version on the day of the experiment (at Time 2 of the current study). Those in the no-training control group were not required to perform any additional activities from usual during this interim period. A similar training has been reported to increase handgrip performance following thought-suppression compared to no training (Muraven et al., 1999).

#### 3.3.4.2 Mindfulness induction

For the mindfulness induction, we used a 10-min of mindful walking exercise (Kabat-Zinn, 1994; Sujiva, 2000; see Appendix 3.3). Participants were asked to intentionally direct their attention towards witnessing the full experience or the sensations of walking (the movements, shifts of weight and balance, and sensations in the feet and legs), as opposed to the physical feet per se. Variants of these instructions were repeated every 60 s for 10 minutes. This exercise is considered as both an example of mindfulness exercises in daily life and a formal meditation practice to cultivate mindfulness (Siegel, Germer, & Olendzki, 2009). Its benefits include (i) people with difficulty to stay still for a long time may find walking to be easier to help them develop attention and awareness, (ii) the bodily experience of walking provides more clear and vivid subject for meditation than meditation while sitting and lying, (iii) body awareness is in fact the first foundation of mindfulness (see Bien & Didonna, 2009). Even though empirical evidence of the efficacy of this exercise *per se* seems to be lacking, it has been formally integrated in the Mindfulness-Based Stress Reduction (Centre for Mindfulness, 1995) and Mindfulness-Based Cognitive Therapy (Oxford Mindfulness Centre, 2002).

For the control condition, we used the Progressive Muscle Relaxation (PMR: Jacobson, 1938; see Appendix 3.4) exercise. Specifically, participants were guided by

a 10-min audio instruction to tense each muscle group vigorously but without straining, and then suddenly release the tension and feel the muscle relax. This exercise was given to rule out the possibility that relaxation alone could account for the effects of mindfulness induction—since mindfulness training is modelled after meditation exercise, which often leads to not only sustained attention on the present moment, but also relaxation (Baer, 2003).

#### 3.3.4.3 Direct aggressive behaviour

We used the adapted Taylor Competitive Reaction Time (TCRT: Taylor, 1967) to provoke participants' aggressive behaviour, using E-Prime software. The TCRT task has been employed to measure the effect of self-control training (Denson et al., 2011) and mindfulness induction (Heppner et al., 2008) on aggressive behaviour.

Participants were informed that they would be playing a computer-based competition task against an opponent located in a nearby room —In reality there was no opponent and the outcome of the task was pre-programmed. The task was presented as a series of reaction-time trials, in which participants have to respond (i.e., hit the spacebar on the computer keyboard) as fast as they can when a white circle stimuli appeared on the screen. Each time they won a trial, they were asked to deliver a noise blast to the opponent, by selecting a level ranging from 0 (no blast, non-aggressive option) through to 8 (maximum blast). When they lost a trial, they received a noise blast (lasted for 500 ms) through surround earphones at a level chosen by the opponent. The maximum blast level delivered to the participants was set according to their own threshold. Specifically, prior to the TCRT task, participants indicated the maximum intensity they were prepared to accept (up to a maximum of 90 db). This maximum level was then reduced in units of 5 db from 8 to 1.

In the TCRT task, participants always won the first trial to assess baseline blast intensity that they delivered without any provocation from the opponent. On subsequent losing trials, they received blasts in two blocks, i.e., low intensity (40 trials, in which participants lost 50% of time at random and received blast levels 1 to

4) and higher intensity (40 trials, in which participants lost 50% of time at random and received blast levels 5 to 8). Hence, participants experienced no provocation, low provocation, and high provocation trials.

The intensity of blasts delivered to the opponent under each block of trials (no provocation, mean low provocation, and mean high provocation) was used as a measure of direct aggression (see e.g., Giancola & Parrott, 2008; for further evidence of the validity of this paradigm). Due to restrictions by the Local Ethics Committee, blast duration typically measured in the TCRT studies was not assessed in the current study. Instead, we used the maximum blast latency (i.e., the number of trials participants waited before delivering the maximum blast; see Lawrence & Hutchinson, 2013a, 2013b) as an additional measure of direct aggression.

#### 3.3.4.5 Indirect aggression

To avoid suspicions that the participants were playing against a computer, and moreover to provide alternative ways of aggression measures, at the end of the TCRT task participants were asked to make an evaluation of the opponent. Participants made their ratings on how aggressive, skilful, competitive, and fair they opponents were, and on their willingness to play against the same opponent again in future studies on a 7-point scale (1 = *completely disagree* and 7 = *completely agree*). Prior to the evaluation, participants were told that their judgment would help the experimenter decide whether to use the opponent in future studies with payment or not, and that their evaluation would be kept confidential. We called this evaluation "indirect aggression" (see Lawrence & Hutchinson, 2013a 2013b).

#### 3.3.4.6 Self-control performance (Handgrip task)

Self-control performance was measured using a handgrip task. This is a well-established measure of self-control which compromises resisting fatigue and overriding the urge to quit (see Hagger et al., 2010). We used a commercially

available digital hand grip dynamometer designed for measuring the flexion of the wrist and an accurate reading of grip strength using the dominant hand. Since we were interested to measure not the physical power but the self-control power, we asked participants to continuously squeeze the handgrip for as long as they could and timed how long the participant held the handles squeezed.

### 3.3.5 Power calculation

Due to a lack of previous similar study, a precise effect size for this current study could not be predicted. A total 128 participants is required to detect a medium effect (*d* = .25) for four groups and 1 covariate (sex), and given the power of .80 and an alpha level of .05 as calculated by G*Power 3 (2013).

### 3.3.6 Procedure

Potential participants from University of Nottingham (UoN) were recruited for the current study via posters/leaflets on campus and departmental mailing list. Participants were told the study was investigating the effects of personality traits and experimental treatments on the way people perform in a competitive reaction-time task (Appendix 3.5). Crucially, they were asked to take part in two times point, and were informed that following the Time 1 of the study, they may or may not be randomly allocated to perform a two-week exercise of maintaining a good posture afterwards. At Time 1, participants were given a chance to win £25 prize draw. At Time 2, they were given inconvenience allowance of £5 and a chance to win £25 for the fastest participants' reaction time across all participants.

***Time 1.*** Interested participants were replied with one of the alternative four website links (each link represented a different group of experiment in the current study). Similar to Study 1, interested participants were first shown an electronic information sheet indicating the purpose of the study (Appendix 3.6). After giving informed consent, they were asked to provide demographic information (i.e., sex, age,

ethnicity, and current mindfulness practice) and to complete the online version of the trait measures (see section 3.3.3 and Appendix 2.2). Upon completion of the survey, participants were asked to enter an email address to win a £25 prize draw. They were also told that this email address would be used for further invitation to Time 2 of the study; however, their lack of participation in Time 2 did not affect their entry into the incentive prize draw from Time 1.

***Two-week interim.*** At the end of the online survey, those allocated to self-control training were instructed to perform a two-week task of improving posture (Appendix 3.7). Specifically, participants were asked to monitor and correct their postures (e.g., sit up straight, walk erectly, etc.) at all times. Daily remainders were sent via email, along with a single question about how compliance they were with the training (see Appendix 3.2). Some participants replied to the emails with their compliance scores on a daily basis, whereas others handed in the print out version at Time 2. No additional activities were imposed for those in the no self-control training.

***Time 2.*** Two weeks after Time 1, participants came into the lab in the School of Psychology individually. Information about this part of the study was presented (Appendix 3.8), along with consent form (Appendix 3.9). Half of those in the self-control training group and half in the no training condition were asked to watch a 3 min video demonstration of mindfulness walking exercise, whereas the rest of the participants watched the relaxation exercise video. Then experimenter left the room, while participants listened to and practised the appropriate audio guided instruction for 10 minutes.

The experimenter entered the cubicle door at the end of 10 minutes, and asked them to complete the Toronto Mindfulness Scale (TMS, Lau et al., 2006). Then the experimenter left the room for a while ostensibly to prepare their TCRT task opponent. When the experimenter returned to the room, they told the participants that their opponent was now ready to play against them. Then the participants were left alone to perform the TCRT task. When the participant opened the cubicle door to indicate the end of the TCRT, they were asked to complete the PANAS (Watson et

al., 1988) and to perform a handgrip task. At the end of the study, participants were debriefed and given help and support information (Appendix 3.10).

### 3.3.7 Data analysis

Associations between personality variables, and between personality variables and the experimental outcomes (i.e., aggressive behaviour and self-control performance) were examined using zero-order correlations, independent *t*-tests and one-way ANOVAs as appropriate. The efficacy of the experimental conditions was assessed using independent *t*-tests or one-way ANOVAs. These statistical analyses were performed using IBM SPSS statistics 20.0 (2011).

#### 3.3.7.1 Effect of mindfulness induction and self-control training on aggressive behaviour

A bootstrapping method using model "number 1" in the A. F. Hayes's (2012a) PROCESS macro for simple moderation (see section 2.3.6.1, Chapter 2) was employed for the primary hypotheses. In this proposed model, self-control training was used as predictor, mindfulness induction as moderator, and aggressive behaviour as outcome. Aggressive behaviour was measured in terms of (i) blast intensity on each provocation level (i.e., no provocation, low provocation, high provocation), (ii) maximum blast latency (i.e., the number of trials participants waited before delivering the maximum blast to the opponent), and (iii) rating indirect aggression (i.e., anonymous reputation damage of the opponent's aggressiveness, skilfulness, competitiveness, fairness, participants willingness to play against the same opponent again in).

The proposed effect of mindfulness induction on the link between self-control training and blast intensity (Hypothesis 3a) and rating indirect aggression (Hypothesis 3c) would be supported if the interaction coefficient between self-control training and mindfulness induction is statistically different from zero. For indirect aggression, we tested if the effect would survive Bonferroni corrections set at $p < .05/5$ items (or $p < .01$).

Hypothesis 1a, 1c and 2a, 2c would be confirmed if the proposed moderation model provides a significant main effect of mindfulness induction and self-control training on blast intensity and ratings of the opponent.

For the maximum blast latency, we conducted a censored survival analysis using Cox regressions to assess the extent to which participants would be more likely to administer the maximum blast to the opponent as a function of experimental conditions. We expected that maximum blast latency would be predicted by mindfulness induction (Hypothesis 1b), self-control training (Hypothesis 2b), and the interaction between self-control training and mindfulness induction (Hypothesis 3b).

For Hypothesis 4, the moderation models above would be repeated while accounting for the potential influence of the hypothesised covariates, based on the significant zero-order correlations between personality variables and aggressive behaviour.

#### 3.3.7.2 Effect of mindfulness induction and self-control training on self-control performance

The proposed role of mindfulness induction on the link between self-control training and self-control performance (handgrip power) was also examined using bootstrapping method for simple moderation. We expected that the interaction coefficient between self-control training and mindfulness induction would be statistically different from zero after accounting for the potential influence of the hypothesised covariates, based on the prior significant zero-order correlations between covariates and self-control performance (Hypothesis 5).

## 3.4 RESULTS

### 3.4.1 Baseline levels

The four experimental groups (i.e., self-control training plus mindfulness, self-control training no mindfulness, no self-control training mindfulness, no self-control training

no mindfulness) were not significantly different from each other in means of the trait measures ($p$ = .37 to .99), indicating groups equivalency at baseline levels.

### 3.4.2 Preliminary analysis

The zero-order correlations amongst trait measures and descriptive statistics are presented in Table 3.1 ($N$ = 99). All measures showed good internal reliabilities ($\alpha$ = .79 to .80). Crucially, replicating the findings from Study 1 (section 2.4.4, Chapter 2), trait mindfulness and trait self-control were positively correlated to each other and negatively correlated to the aggression measures.

Table 3.1.
*Zero order correlations and psychometric properties of measures*

| Measures | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| MAAS (1) | 1.00 | | | | | | | | |
| SCS (2) | .52*** | 1.00 | | | | | | | |
| Total AQ (3) | -.42*** | -.39*** | 1.00 | | | | | | |
| AQ Physical (4) | -.29** | -.24* | .82*** | 1.00 | | | | | |
| AQ Verbal (5) | -.22* | -.21* | .79*** | .58*** | 1.00 | | | | |
| AQ Anger (6) | -.37*** | -.42*** | .86*** | .58*** | .59*** | 1.00 | | | |
| AQ Hostility (7) | -.47*** | -.43*** | .79*** | .55*** | .40*** | .59*** | 1.00 | | |
| STAR Provocations (8) | -.36*** | -.28** | .50*** | 34*** | .25* | 46*** | 55*** | 1.00 | |
| STAR Frustrations (9) | -.35*** | -.32** | .53*** | .39*** | .25* | .49*** | .59*** | .73*** | 1.00 |
| *M* | 3.69 | 3.13 | 2.53 | 2.14 | 2.83 | 2.41 | 2.74 | 2.87 | 2.54 |
| *SD* | .83 | .59 | .63 | .71 | .76 | .83 | .79 | .82 | .82 |
| $\alpha$ Cronbach | .88 | .80 | .90 | 79 | .82 | .87 | .90 | .77 | .73 |

*Note*. MAAS = Mindful Attention Awareness Scale; SCS = Self-Control Scale; AQ = Aggression Questionnaire; STAR = Situational Triggers of Aggressive Responses
*$p$ < .05; **$p$ < .01; ***$p$ < .001

Additionally, females ($n$ = 51) and males ($n$ = 48) did not differ in any trait measures ($p$ = .07 to .73). Compared to non self-harmers ($n$ = 85), self-harmers ($n$ = 14) scored lower on trait mindfulness ($t$(97) = -1.95, $p$ <.05; $M$ self-harmers = 3.29, $SD$ =.79 vs. $M$ non self-harmers = 3.75, $SD$ =.82), but higher on trait aggression ($t$(97) = 3.23, $p$ < .01; $M$ self-harmers = 3.01, $SD$ = .71 vs. $M$ non self-harmers = 2.45, $SD$ = .58), physical aggression ($t$(97) = 3.41, $p$ < .001; $M$ self-harmers = 2.71, $SD$ = .83 vs. $M$ non self-harmers = 2.05, $SD$ = .65), hostility ($t$(97) = 3.38, $p$ < .001; $M$ self-harmers = 3.37, $SD$ =

.83 vs. *M* non self-harmers = 2.64, *SD* = .73), sensitivity to provocations (SP: $t(97) = 2.10$, $p < .05$; *M* self-harmers = 3.29, *SD* = .95 vs. *M* non self-harmers = 2.80, *SD* = .78), and sensitivity to frustrations (SF: $t(97) = 2.59$, $p < .01$; *M* self-harmers = 3.05, *SD* = .89 vs. *M* non self-harmers = 2.45, *SD* = .78).

Due to a small number of participants who currently engaged in mindfulness practice (*n* = 8 out of 99), this variable was dichotomised, resulting in a positive association between current mindfulness practice and trait self-control ($t(97) = 2.02$, $p < .05$; *M* with mindfulness practice = 3.52, *SD* = .36 vs. *M* with no mindfulness practice = 3.09, *SD* = .60), and an approaching significant relation with trait physical aggression ($t(97) = 1.97$, $p = .052$; *M* with mindfulness practice = 2.61, *SD* = .66 vs. *M* with no practice = 2.10, *SD* = .70). Ethnicity was linked to trait mindfulness ($F(2,94) = 4.15$, $p < .05$; *M* White = 3.53, *SD* = .76 vs. *M* Asian = 3.96, *SD* = .90 vs. *M* "Others" = 4.18, *SD* = .69) and to self-harm status ($\chi^2(2) = 7.38$, $p < .05$; *n* White = 12 [85.7% of the total that self-harmed] vs. *n* Asian = 0 vs. *n* "Others" = 2 [14.3% of the total]).

When we ran partial correlations controlling for self-harm status, the correlation between trait mindfulness and verbal aggression fell just short of significance ($r = -.18$, $p = .06$), and so did the relationship between trait self-control and verbal aggression ($r = -.20$, $p = .051$). None of the associations were significantly altered when we controlled participants' sex ($r = -.21$ to .88), ethnicity ($r = -.22$ to .86), or current mindfulness practice ($r = -.22$ to .87).

### 3.4.3 Zero-order correlations between personality variables and experimental outcomes

Table 3.2 depicts the associations between personality variables and experimental outcomes (i) direct aggression: blast intensity on each provocation level and maximum blast latency, (ii) five ratings of indirect aggression, and (iii) self-control performance/handgrip power. Significantly associated personality variables would be controlled in further analyses.

Table 3.2.

*Zero order correlations of personality measures, aggressive behaviour, and self-control performance*

| Measures | Blast intensity based on levels of provocation | | | Max. blast latency | Rating indirect aggression | | | | | Handgrip power |
|---|---|---|---|---|---|---|---|---|---|---|
| | No | Low | High | | Aggressive | Skilful | Competitive | Fair | Play again | |
| MAAS | .08 | .06 | .03 | .08 | .08 | -.23* | .05 | -.03 | -.07 | -.02 |
| SCS | -.03 | -.01 | -.08 | .04 | -.01 | -.17 | .09 | -.12 | -.09 | .19 |
| AQ Total | .12 | .12 | .15 | -.12 | .05 | .13 | -.06 | .13 | .06 | -.10 |
| AQ Physical Aggression | .14 | .07 | .09 | .23* | .09 | .09 | -.08 | .08 | .07 | .003 |
| AQ Verbal Aggression | .11 | .11 | .12 | -.13 | .02 | .15 | -.08 | .20 | .07 | .01 |
| AQ Anger | .001 | .09 | .13 | .07 | .01 | .08 | -.03 | .10 | -.04 | -.14 |
| AQ Hostility | .14 | .13 | .17 | -.12 | .05 | .11 | -.02 | .04 | .10 | -.18 |
| STAR Provocation | .15 | .22* | .30** | -.14 | -.09 | .02 | .04 | .10 | .18 | -.21* |
| STAR Frustration | .02 | .05 | .17 | -.08 | .07 | .01 | .01 | -.04 | .06 | -.11 |
| TMS Curiosity | .15 | .18 | .26** | -.01 | -.02 | .26** | .19 | .16 | .01 | -.03 |
| TMS Decentering | .09 | .17 | .16 | -.002 | -.07 | .08 | .16 | .10 | .02 | .13 |
| PANAS PA | .29** | .32** | .28** | -.09 | .14 | .11 | .38*** | .20* | .14 | .16 |
| PANAS NA | .17 | .27** | .25* | -.10 | -.05 | .07 | -.01 | -.03 | .003 | -.03 |

*Note.* MAAS = Mindful Attention Awareness Scale; SCS = Self-Control Scale; AQ = Aggression Questionnaire; STAR = Situational Triggers of Aggressive Responses; TMS = Toronto Mindfulness Scale, PANAS 1 = Positive Affect Negative Affect following depletion; PANAS 2 = Positive Affect Negative Affect after TCRT task

All correlations were based on $N$ = 99, except for maximum blast latency. The correlations for maximum blast latency was made only for participants who delivered a maximum blast ($N$ = 83).

$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

#### 3.4.3.1 Associations with direct aggression

Individual differences in SP were positively associated with provoked direct aggression, but not to unprovoked aggression. Direct aggression under all levels of provocation was related, positively, to positive affect (PA). Direct aggression did not differ as a function of participants' sex ($p$ = .17 to .37; see Table 3.3), self-harm status ($p$ = .28 to .92), ethnicity ($p$ = .18 to .25), or mindfulness practice ($p$ = .49 to .89).

Higher trait physical aggression was associated with earlier deliverance of the maximum blasts to the opponent. The likelihood of delivering the maximum blast sooner was approaching significant for self-harmers ($n$ = 11) compared to non self-harmers ($n$ = 72; $t(81) = 1.88$, $p$ = .06; $M$ self-harmers = 7.55, $SD$ = 9.62 vs. $M$ non self-harmers = 13.11, $SD$ = 9.07). No differences on maximum blast latency were found between males ($n$ = 39) and females ($n$ = 44; $t(81) = -1.25$, $p$ = .22), between those who currently practice mindfulness ($n$ = 5) and those without these practices ($n$ = 78; $t(81) = 1.65$, $p$ = .10) or between ethnicities ($F(2,79) = .67$, $p$ = .52).

#### 3.4.3.2 Associations with indirect aggression

The rating of opponent skill was negatively related to trait mindfulness and positively related to curiosity. The rating of opponent competitiveness and fairness was positively related to PA. None of the indirect aggression ratings differed as a function of participants' sex ($p$ = .20 to .95), self-harm status ($p$ = .36 to .91), ethnicity ($p$ = .10 to .87), or current mindfulness practice ($p$ = .10 to .76).

#### 3.4.3.3 Associations with self-control performance

Self-control performance (i.e., handgrip power) was negatively related to SP. A better handgrip performance was shown by males compared to females ($t(83.17) = 3.61$, $p < .001$; $M$ male = 111.65, $SD$ = 87.87 vs. $M$ female = 56.53, $SD$ = 60.64), and by those who classified themselves as belonging to "Others" ethnicity background ($M$ "Others" = 162.14, $SD$ = 145.66) compared to White ($M$ = 84.72, $SD$ = 74.67) or Asian

(*M* = 64.69, *SD* = 60.47; *F*(2.94) = 4.46, *p* < .05). Handgrip power did not differ as a function of self-harm status (*p* = .58), or current mindfulness practice (*p* = .24).

### 3.4.4 Manipulation Checks

To determine whether participants in the self-control training (*n* = 49) were modifying their posture during the 2-week interim, we examined their responses in the journals. The majority of participants reported compliance with the self-control training instructions to an average level (*M* = 3.47 out of 6, *SD* = .92), suggesting that they were relatively successful in following the instructions.

Participants in mindfulness walking exercise (*n* = 49) did not report higher curiosity (*t*(97) =.87, *p* = .38; *M* mindfulness induction = 2.20, *SD* = .89 vs. *M* no induction = 2.04, *SD* = .94), or decentering (*t*(97) = 1.12, *p* = .31; *M* mindfulness induction = 2.07, *SD* = .63 vs. *M* no induction = 1.94, *SD* = .64) than relaxation participants (*n* = 50). Thus differential effect between mindfulness induction and relaxation should be carefully interpreted as both conditions induced a comparable level of state mindfulness. Internal consistency were good for curiosity ($\alpha$ = .86) and fair for decentering ($\alpha$ = .67). Both subscales were positively correlated (*r* = .37, *p* < .001).

Following the TCRT task, no mood differences were found between the four between subjects groups on PA (*F*(3,95) = 1.27, *p* = .29), or NA (*F*(3,95) = .29, *p* = .83). Both mood subscales showed good internal consistency ($\alpha$= .84 and .77 for PA and NA, respectively), and were positively correlated (*r* = .22, *p* < .05).

### 3.4.5 Effect of mindfulness induction and self-control training on direct aggression

#### 3.4.5.1 Levels of blast intensity

Since all participants experienced no provocation, low provocation, and high provocation trials, we used a one-way repeated-measure ANOVAs to test if each trial

provoked different responses. Blast intensity was significantly affected by level of provocation ($F(1.38, 135.33) = 22.90$, $p < .0001$; Figure 3.2). Specifically, more intense blasts were shown on high provocation ($M = 4.45$, $SD = 1.99$) compared to low provocation ($M = 3.54$, $SD = 1.81$; $p < .0001$), and borderline differences were shown on low provocation compared to no provocation ($p = .055$; $M = 3.13$, $SD = 2.71$).

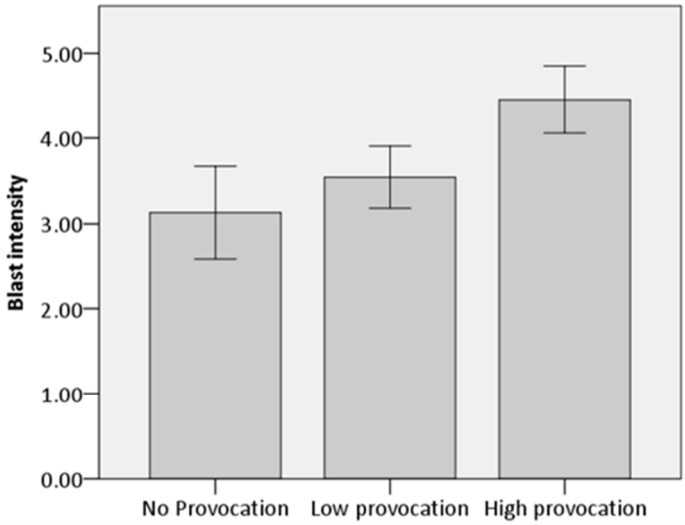


Figure 3.2. Effect of level of provocations on blast intensity.
Error bars indicate standard error of mean. Scale goes up to 8 as a maximum.

When we included sex a 2 (sex) by 3 (provocation level) mixed analysis ANOVA, blast intensity was still affected by provocation levels ($F(1.40, 135.95) = 23.38$, $p < .0001$), and by provocation level x sex ($F(1.40, 135.95) = 5.38$, $p < .05$). Specifically, sex differences occurred under no provocation compared to low provocation ($p < .01$), but not under low provocation compared to high provocation ($p = .85$). In other words, females (compared with males) delivered more intense blasts as the level of provocations increased. The main effect of sex was not significant (Table 3.3).

Table 3.3.
*Sex differences on blast intensity on each provocation level*

| Level of provocations | Males ($n = 48$) | Females ($n = 51$) | $t$ |
|---|---|---|---|
| | $M$ ($SD$) | $M$ ($SD$) | |
| No provocation | 3.52 (2.92) | 2.76 (2. 46) | $t(97) = 1.40$, $p = .17$ |
| Low provocation | 3.37 (1.99) | 3.70 (1.63) | $t(90.87) = -.90$, $p = .37$ |
| High provocation | 4.26 (2.10) | 4.64 (1.88) | $t(97) = -.94$, $p = .35$ |

$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

For the main hypothesis, the mindfulness induction x self-control training model on blast intensity was tested across three provocation levels, using a bootstrapping method with 95% bias-corrected confidence intervals (based on 5,000 bootstrap resamples, *N* = 110; see Table 3.4 and Figure 3.3). All predictors were mean-centered. Contrary to prediction (Hypothesis 1a), mindfulness induction did not influence blast intensity. Supporting Hypothesis 2a, self-control training influenced provoked, but not unprovoked aggression. Specifically, self-control trained participants showed lower levels of blast intensity under low and high provocation trials than non self-control trained participants. No support was found for Hypothesis 3a, in that there was no significant effect of mindfulness induction on the link between self-control and blast intensity under all levels of provocation. Self-control trained participants who received mindfulness induction delivered a comparable level of blast intensity with self-control trained ones with no mindfulness induction under all levels of provocation.

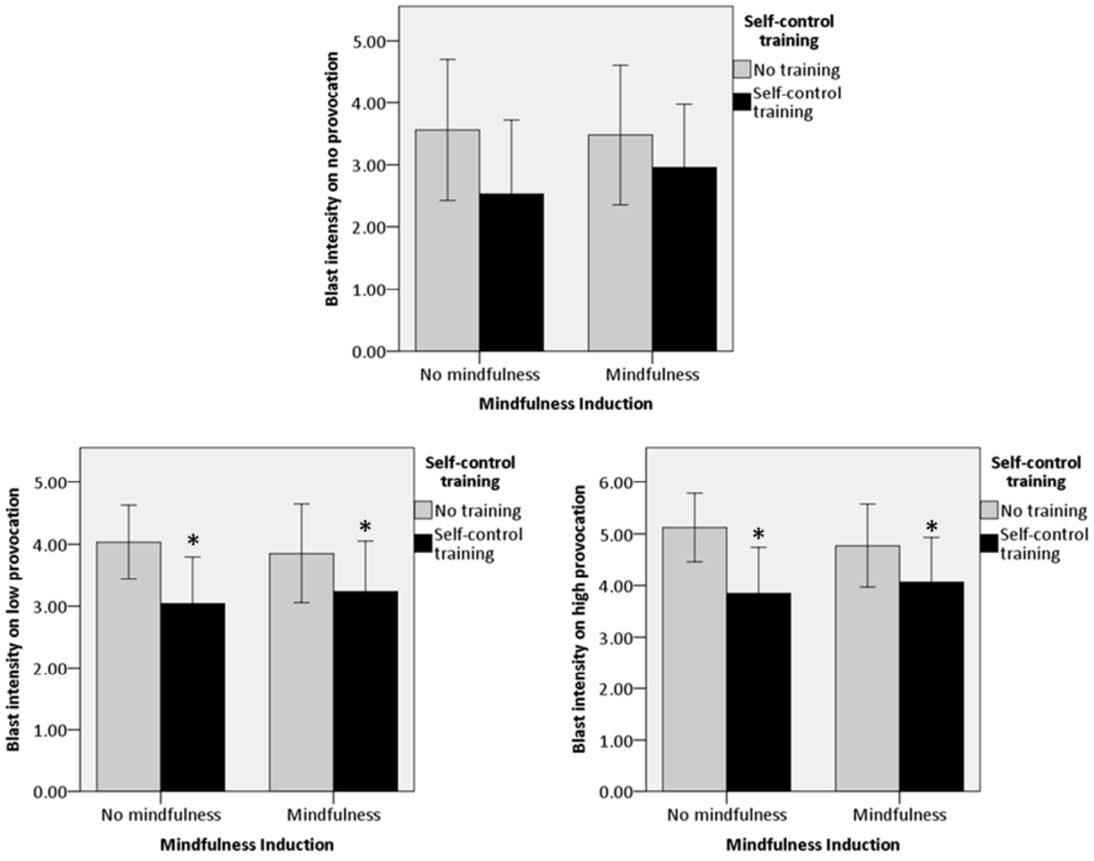


Figure 3.3. Mindfulness x self-control training effect on blast intensity. Error bars indicate standard error of mean, asterisk indicates significant ($p$ < .05) decrease in blast intensity. Scale goes up to 8 as a maximum.

Table 3.4.
*Moderation models with bootstrapping method, using self-control training as predictor, mindfulness as moderator, blast intensities as outcome*

| Model tested | No provocation | | Low provocation | | High provocation | |
|---|---|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* | *B* | *SE* |
| Self-control training ($c_1$) | -.78 | .55 | -.81* | .36 | -.99* | .39 |
| Mindfulness induction ($c_2$) | .18 | .55 | .004 | .36 | -.07 | .39 |
| Self-control x mindfulness ($c_3$) | .52 | 1.09 | .38 | .72 | -.57 | .78 |
| $R^2$ on interaction | .23% | | .28% | | .51% | |
| Conditional effect of self-control training without mindfulness | -1.04 | .77 | -.99 | .51 | -1.27 | .55 |
| Conditional effect of self-control training with mindfulness | -.53 | .78 | -.61 | .51 | -.71 | .55 |

*Note.* B = unstandardised regression coefficient; *SE* = standard error; $R^2$ = variance increase
*$p < .05$; **$p < .01$; ***$p < .001$

The moderation analysis was then repeated by controlling for the associated personality variables (PA for all provocation levels, SP for provoked aggression; see again Table 3.2). Controlling for the hypothesised covariates yielded a stronger main effect of self-control training (Table 3.5), in which under provoked aggression, self-control trained participants delivered lower levels of blast intensity than non self-control trained participants. There was still no main effect of mindfulness, or interaction effect of self-control training x mindfulness on blast intensity (Hypothesis 4). Higher SP predicted higher *provoked* aggression, but no differences in blast intensity were found as a function of SP in the absence of provocation. Higher levels of PA predicted more intense blasts across all provocation levels.

Table 3.5.
*Moderation models with bootstrapping method, using self-control training as predictor, mindfulness as moderator, blast intensities as outcome, controlling for covariates*

| Model tested | No provocation | | Low provocation | | High provocation | |
|---|---|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* | *B* | *SE* |
| Self-control training ($c_1$) | -.71 | .52 | -.76* | .33 | -.96** | .35 |
| Mindfulness induction ($c_2$) | .45 | .53 | .26 | .33 | .19 | .36 |
| Self-control x mindfulness ($c_3$) | -.24 | 1.05 | .11 | .62 | .28 | .70 |
| $R^2$ on interaction | .05% | | .02% | | .13% | |
| Covariates: | | | | | | |
| SP | - | - | .65** | .20 | .89*** | .22 |
| PANAS PA | 1.10** | .36 | .94*** | .23 | .94*** | .25 |

*Note. B* = unstandardised regression coefficient; *SE* = standard error; $R^2$ = variance increase
*$p < .05$; **$p < .01$; ***$p < .001$

#### 3.4.5.2 Maximum blast latency

During the TCRT, 83 participants out of 99 delivered maximum blasts to the opponents. Censored survival analyses using Cox regressions were carried out to assess the extent to which individuals were more likely to administer the maximum blasts as a function of the mindfulness induction and self-control training conditions. Contrary to prediction, our proposed model was not significant ($\Delta\chi^2$ = 1.63, $p$ = .65). The likelihood of delivering the maximum blast earlier was not predicted by the main effect of mindfulness induction (Hypothesis 1b: Wald = 1.40, $p$ = .24, 95%CI [77, 2.93], exp(*B*) = 1.50), self-control training (Hypothesis 2b: Wald = .16, $p$ = .69, CI [.60, 2.15], exp(*B*) = 1.14), or the interaction between mindfulness induction and self-control training (Hypothesis 3b: Wald = .31, $p$ = .58, CI [.32, 1.88], exp(*B*) = .78).

The censored survival analyses were repeated to assess the maximum blast latency as a function of the experimental conditions and the hypothesised covariates (physical aggression). Our final model was still not significant (Hypothesis 4: $\Delta\chi^2$ = 3.88, $p$ = .42). The point at which participants delivered the maximum blast to opponent was not influenced by the experimental conditions ($p$ = .79, .37 and .67 for the effect of self-control training, mindfulness induction, and self-control training x mindfulness induction, respectively), or by the main effect of physical aggression (Wald = 2.15, $p$ = .14, CI [.93, 1.72], exp(*B*) = 1.26). Interestingly, when we analysed this model separately for males and females, the findings varied (Figure 3.4).

For females ($n$ = 44), the mindfulness induction x self-control training model was significant ($\Delta\chi^2$ = 11.16, $p$ < .05). There were significant main effects of mindfulness induction (Wald = 6.66, $p$ < .01, CI [1.41, 12.13], exp(*B*) = 4.13), and physical aggression (Wald = 7.37, $p$ < .01, CI [1.24, 3.87], exp(*B*) = 2.19) on maximum blast latency. Specifically, females with no mindfulness induction and higher in physical aggression were more likely to deliver the maximum blast. There was still no main effect of self-control training (Wald = .83, $p$ = .36, CI [.60, 4.08], exp(*B*) = 1.56), or interaction effect of mindfulness induction x self-control training (Wald = 2.65, $p$ = .10, CI [.09, 1.25], exp(*B*) = .33) on maximum blast latency.

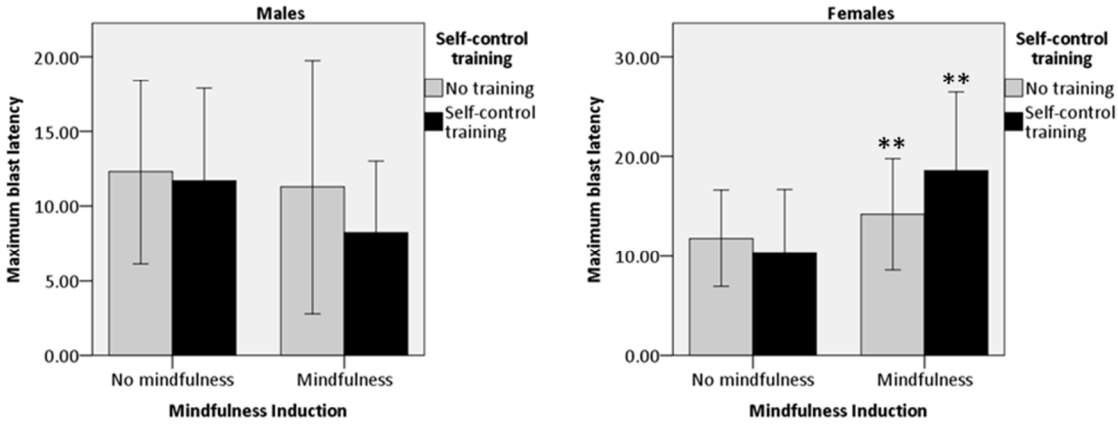


Figure 3.4. Sex differences in maximum blast latency. Error bars represent standard error of mean, asterisk indicates that participants waited significantly longer ($p < .01$) before delivering the maximum blast.

For males ($n$ = 39), the mindfulness induction x self-control training model was not significant ($\Delta\chi^2$ = 1.62, $p$ = .81). Maximum blasts latency was not predicted by mindfulness induction (Wald = .49, $p$ = .48, CI [.23, 2.00], exp($B$) = .68), self-control training (Wald = 1.22, $p$ = .27, CI [.21, 1.55], exp($B$) = .57), interaction between conditions (Wald = .36, $p$ = .55, CI [.39, 5.74], exp($B$) = 1.50), or physical aggression (Wald = .001, $p$ = .98, CI [.39, 5.74], exp($B$) = .99).

#### 3.4.5.3 Correlation between blast intensity and maximum blast latency

For participants who had delivered the maximum blast ($N$ = 83), there were negative correlations between maximum blast latency and blast intensity across levels of provocation ($r$ = -.40, $p$ < .001 on no provocation, $r$ = -.41, $p$ < .001 on low provocation, and $r$ = -.23, $p$ <.05 on high provocation). This finding indicated that higher blast intensities were delivered by those who had delivered the maximum blast to the opponent earlier. The correlation persisted for males under no provocation and low provocation, and for females under low provocation only. For males, the correlation between maximum blast latency and blast intensity became non-significant under high provocation ($r$ = -.30, $p$ = .07). For females, the correlation between maximum blast latency and blast intensity became non-significant under no provocation ($r$ = -.24, $p$ = .12) and high provocation ($r$ = -.19, $p$ = .22).

### 3.4.6 Effect of mindfulness induction and self-control training on indirect aggression

A bootstrapping procedure was employed again to analyse the proposed impact of mindfulness induction and self-control training on each indirect aggression item (see Table 3.6), but using 99% bias-corrected confidence intervals to survive Bonferroni corrections ($p < .01$). The main impact of mindfulness induction on rating of the opponent's aggressiveness (Hypothesis 1c) did not survive Bonferroni corrections ($p < .03$). There was no main effect of self-control training on indirect aggression (Hypothesis 2c). Mindfulness induction did not moderate the link between self-control training and indirect aggression (Hypothesis 3c).

Table 3.6.
*Moderation models with bootstrapping method, using self-control training as predictor, mindfulness as moderator, rating of opponent as outcome*

| Model tested | Aggressive | | Skilful | | Competitive | | Fair | | Play again | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* | *B* | *SE* | *B* | *SE* | *B* | *SE* |
| Self-control training ($c_1$) | .10 | .25 | -.08 | .22 | -.04 | .22 | -.15 | .28 | -.22 | .31 |
| Mindfulness induction ($c_2$) | -.54* | .25 | -.002 | .22 | -.40 | .22 | -.43 | .28 | -.30 | .31 |
| Self-control x mindfulness ($c_3$) | .20 | .50 | .48 | .44 | .24 | .44 | -.13 | .57 | .29 | .61 |
| $R^2$ on interaction | .15% | | 1.26% | | 30% | | .06% | | .22% | |

*Note. B* = unstandardised regression coefficient; *SE* = standard error; $R^2$ = variance increase
*$p < .05$; **$p < .01$; ***$p < .001$

Because the indirect aggression ratings did not differ as a function of participant' sex (see section 3.4.3), we did not break down the moderation models by sex. As shown in Table 3.7, no sex differences were found in ratings of indirect aggression.

Table 3.7.
*Sex differences based on rating of opponent*

| Indirect aggression | Males ($n$ = 48) | Females ($n$ = 51) | $t$ |
|---|---|---|---|
| | *M* (*SD*) | *M* (*SD*) | |
| Aggressive | 4.27 (1.25) | 4.00 (1.28) | $t(97) = 1.06$, $p = .29$ |
| Skilful | 5.06 (.98) | 4.78 (1.17) | $t(95.08) = 1.30$, $p = .20$ |
| Competitive | 5.23 (1.08) | 5.10 (1.12) | $t(97) = .60$, $p = .55$ |
| Fair | 5.02 (1.34) | 5.04 (1.47) | $t(97) = -.07$, $p = .95$ |
| Play again | 5.48 (1.46) | 5.16 (1.57) | $t(97) = 1.06$, $p = .29$ |

*$p < .05$; **$p < .01$; ***$p < .001$

Based on the prior significant zero-order correlations between covariates and rating indirect aggression (see again Table 3.2), the moderation analyses for ratings of the opponent skill, competitiveness, and fairness were repeated by including the hypothesised covariates (Hypothesis 4, see Table 3.8). There were no effects of experimental conditions on ratings for these items. Those higher in curiosity rated the opponent as being more skilful, whereas the negative impact of trait mindfulness on this rating did not survive Bonferroni correction ($p < .013$). Those who were higher in PA rated the opponent as being more competitive.

Table 3.8.
*Moderation models with bootstrapping method, using self-control training as predictor, mindfulness as moderator, rating of opponent as outcome, controlling for covariates*

| Model tested | Skilful | | Competitive | | Fair | |
|---|---|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* | *B* | *SE* |
| Self-control training ($c_1$) | -.07 | .21 | -.05 | .21 | -.12 | .28 |
| Mindfulness induction ($c_2$) | -.05 | .21 | -.27 | .21 | -.34 | .28 |
| Self-control x mindfulness ($c_3$) | .39 | .41 | .11 | .41 | -.22 | .56 |
| $R^2$ on interaction | .83% | | .06% | | .15% | |
| Covariates: | | | | | | |
| MAAS | -.32* | .13 | - | - | - | - |
| TMS Curiosity | .31** | .11 | - | - | - | - |
| PANAS PA | - | - | .52*** | .14 | .35 | .19 |

*Note. B* = unstandardised regression coefficient; *SE* = standard error; $R^2$ = variance increase
*$p < .05$; **$p < .01$; ***$p < .001$

### 3.4.7 Correlation between blast intensity and indirect aggression

To provide converging evidence, a bivariate analysis was conducted on the aggression measures. Participants evaluated opponents that they had blasted more intensely as being less aggressive, but also more fair and a greater willingness to play against the same opponent again (Table 3.9).

Table 3.9.

*Bivariate correlations between blast intensity and rating of opponent*

| Indirect aggression | No provocation | Low provocation | High provocation |
|---|---|---|---|
| Aggressive | -.13 | -.28** | -.24* |
| Skilful | .08 | -.01 | .02 |
| Competitive | .02 | .00 | .04 |
| Fair | .35** | .42** | .44** |

| Indirect aggression | No provocation | Low provocation | High provocation |
|---|---|---|---|
| Play again | .27** | .21* | .25* |

*$p < .05$; **$p < .01$; ***$p < .001$

### 3.4.8 Effect of mindfulness induction and self-control training on self-control performance

To examine Hypothesis 5, we entered the hypothesised covariates into the moderation models (i.e., sex, SP, and ethnicity; see again Table 3.2). There were no significant main effects of mindfulness induction ($c_2$: $B$ = 9.83, $SE$ = 15.66, $p$ = .53) or self-control training ($c_1$: $B$ = 3.62, $SE$ = 15.22, $p$ = .81) on handgrip power. Those who received mindfulness induction did not show a better handgrip power than those who did not receive mindfulness induction; and self-control trained participants did not show a better handgrip power than non self-control trained participants.


Figure 3.5. Crossover interaction between mindfulness x self-control training on handgrip power. Error bars represent standard error of mean, asterisk indicates significant ($p < .05$) increase in handgrip power.

Contrary to prediction, handgrip power was influenced by a crossover interaction between mindfulness induction and self-control training ($c_3$: $B$ = -64.59, $SE$ = 30.46, $p < .05$) with total variance uniquely attributable to the interaction of 4.07% ($F(1, 90) = 4.50$, $p < .05$). Specifically, a better handgrip power was shown by participants who received one condition only (mindfulness induction or self-control training), but not by those who received both conditions or did not receive any conditions (Figure 3.5).

A better handgrip power was also shown by males as opposed to females ($B$ = 47.38, $SE$ = 15.59, $p$ < .01). The partial effects of ethnicity ($B$ = 5.31, $SE$ = 12.79, $p$ = .68) and SP ($B$ = -14.60, $SE$ = 9.48, $p$ = .13) on handgrip power were not significant.

The crossover interaction between self-control training and mindfulness induction on handgrip performance diminished when males and females were analysed separately. Specifically, handgrip power was no longer predicted by interaction between mindfulness induction and self-control training, or by main effects of mindfulness induction or self-control training (Table 3.10, Figure 3.6).

Table 3.10.

*Moderation models with bootstrapping method, using self-control training as predictor, mindfulness as moderator, handgrip power as outcome*

| Model tested | Males ($n$ = 48) | | Females ($n$ = 51) | |
|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* |
| Self-control training ($c_1$) | 31.94 | 24.96 | -21.49 | 17.04 |
| Mindfulness induction ($c_2$) | 5.62 | 24.98 | 11.26 | 17.04 |
| Self-control x mindfulness ($c_3$) | -85.59 | 49.97 | -37.13 | 34.09 |
| $R^2$ on interaction | 6.04% | | 2.36% | |

*Note.* $B$ = unstandardised regression coefficient; $SE$ = standard error; $R^2$ = variance increase
$^{*}p$ < .05; $^{**}p$ < .01; $^{***}p$ < .001

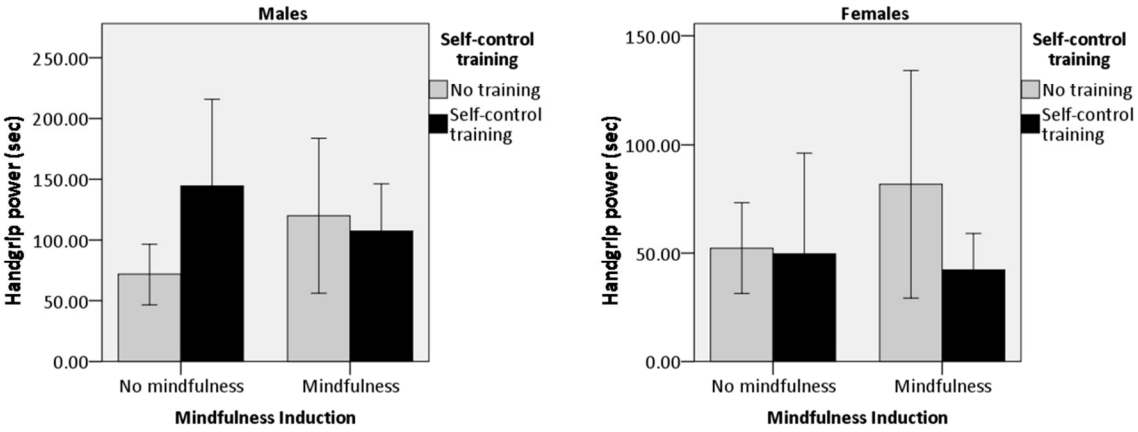


Figure 3.6. Sex differences in handgrip power. Error bars represent standard error of mean.

## 3.5 DISCUSSION

### 3.5.1 Effect of mindfulness induction and self-control training on aggressive behaviour

The current study experimentally activated individual's levels of mindfulness (mindfulness induction vs. relaxation) and self-control (self-control training vs. no training), using 99 (51 females) university students. Contrary to prediction, the first main analysis showed that mindfulness induction neither predicted direct aggression (blast intensity administered to the opponent in the adapted TCRT task), nor moderated the link between self-control training and direct aggression. This finding runs counter the only reported aggression study in mindfulness (Heppner et al., 2008). Specifically, Heppner et al. found that mindfulness induction reduced direct *provoked* aggression amongst participants who had received rejection/insulting feedback as opposed to those in rejection only and non-rejection conditions. It seems unlikely that these contradictory findings would be attributable to the point at which the mindfulness induction was given, as in Heppner et al.'s and our studies, mindfulness induction was given *before* the participants received provocations. Presumably, inducing a state of mindfulness may decrease the preparedness to behave aggressively when aggressive impulses are subsequently stimulated.

It is possible that our mindfulness condition was not effective to produce any significant effect on both direct *provoked* and *unprovoked* aggression (detailed in latter part of this section). It is important to note, however, that participants receiving mindfulness induction were no more aggressive than the control condition. It has been speculated elsewhere that sustaining attention on the task at hand without acting on the associated emotional contents might be especially difficult for novice practitioner (Holzel et al., 2011; Sauer et al., 2013). Rather, this attempt may lead them to over-regulate (e.g., suppress, avoid) their emotions and increase the likelihood of aggressive behaviour (see Roberton et al., 2012). Despite the lack of formal experience in mindfulness practices (only 5% participants reported currently having mindfulness practice), initial encounter with this practice did not increase their direct aggression.

It is also plausible that the impact of mindfulness induction was not readily observed because our participants were, in fact, under the conditions of full self-control resources. Research with respect to the strength model of self-control has typically shown that experimental manipulations, such as glucose (Gailliot et al., 2007), self-affirmation (Schmeichel & Vohs, 2009), and positive affect (Tice, Baumeister, Shmueli, & Muraven, 2007), rarely increase self-control performance for non-depleted participants. In the same way, it may be that mindfulness induction only becomes effective under circumstances where individuals are depleted, independent of provocation condition. The proposed impact will be tested under ego-depleted condition in the next studies in this thesis.

On the other hand, blast intensity in response to provocations was significantly decreased by a two-week training of improving posture. As a comparison, in Denson et al.'s (2011) study, the effect of self-control training on provoked aggression was shown only amongst those high in trait aggression; whereas in Finkel et al.'s (2009) study, this effect was investigated under depleted condition (all participants were asked to engage in an attention control task, before they responded to partner's provocation). We expanded these past studies by including a no-provocation condition, showing that while training in self-control may increase self-control resources, the benefits of this training on aggressive behaviour may be salient in particular when aggressive impulses have been stimulated (i.e., following provocation), even in the absence of depleted condition. This effect persisted after accounting for significantly related personality variables (i.e., sensitivity to provocation [SP] and positive affect), and was consistent across sexes. Thus regardless of individual differences in sensitivity to provocation, mood, and sex, increases in self-control resources may predict people's ability to refrain from behaving aggressively when the urge to aggress is relatively strong.

Resembling Lawrence and Hutchinson's (20013b) finding, individual differences in SP also independently predicted direct provoked aggression. In addition, blast intensity in all provocation levels was associated with post-TCRT positive affect. As the mood measure was given after the TCRT task, this finding supports the view that those who expressed their aggression in response to provocation may do so in order to improve

their mood (Bushman et al., 2001). However, in order to assess this fully, a baseline mood assessment would have been needed. The subsequent studies reported in this thesis will do just this.

The second main analysis revealed that the extent to which participants delivered the maximum noise blast to the opponent was independent of mindfulness induction and self-control training. However, when males and females were analysed separately, a main effect of mindfulness induction occurred for female participants. Specifically, the likelihood of delivering the maximum blast earlier decreased for females with mindfulness induction, as opposed to females with no mindfulness induction. This indicates that mindfulness induction may be a way to reduce aggression in its more subtle/implicit form (as represents by the maximum blast latency), and therefore more suitable to attenuate females' than males' aggression (for a discussion on various forms of aggression in the TCRT task, see Giancola & Parrot, 2008).

In terms of the effect of the mindful and self-control manipulations on indirect aggression, self-control training had no influence, whereas there was a minor contribution of mindfulness induction. Specifically, participants receiving mindfulness induction (compared with no induction) rated the opponent as being less aggressive; however, this tendency did not survive Bonferroni correction. Whilst it is difficult to raise any definitive conclusion based on the trivial effect of mindfulness, one could argue that the lack of a role of self-control on indirect aggression is due to the nature of the training used. That is, self-control training involving *physical* behaviour may have a noticeable effect on direct (physical) aggression but not on indirect aggression. Although training in one sphere of self-control has been demonstrated to improve the general capacity of self-control (see Baumeister et al., 2006; Hagger et al., 2010), future work could fruitfully explore whether different types of training would produce differential effects on direct and indirect aggression.

In addition, self-harm status had no influence on blast intensity or indirect aggression, although the likelihood of delivering the maximum blast sooner was

approaching significance for self-harmers. As that self-harm status in the current sample was related to most of the self-reported aggression measures (see section 3.4.2), it is plausible that under full self-control resource, the provocation procedure in the TCRT task might also not be strong enough to activate the link between self-harm and aggressive behaviour. Whether or not this link could be activated under depleted self-control resource will be investigated in the next studies.

Finally, neither direct nor indirect aggression was not related to participant's background in current mindfulness practice. However, the unequal sample size between experienced and non-experienced mindfulness practitioners might have compromised this result. Likewise, direct and indirect aggression was not predicted by ethnicity. Further cross-cultural comparison is indeed crucial (see Chapter 6), as association between cultural background and different types of aggression has been widely demonstrated (e.g., Forbes et al., 2009; Li et al., 2010; Magnis-Suseno, 1997).

### 3.5.2 Effect of mindfulness induction and self-control training on self-control performance

Considering that males should be stronger than females with respect to their handgrip power, the influence of participants' sex was controlled in this analysis. Mirroring the insignificant effect of mindfulness induction on blast intensity, no main effect of mindfulness induction was found on self-control performance (i.e., handgrip power). Unusually, self-control performance was also not predicted by the main effect of self-control training.

There was, however, a crossover interaction between mindfulness induction and self-control training. Specifically, individuals receiving both mindfulness induction and self-control training showed a lower handgrip power than those receiving one condition only. As such, mindfulness and self-control appeared to work in an antithetical way. Even though this possibility should be taken into account, it is feasible that because the self-control performance was measured *after* the experience of provocation, the expected independent effect of mindfulness

induction and self-control training as well as the complementary benefit of these exercises could not be revealed. In the typical the strength model of self-control studies, the effect of self-control training is measured on the performance in self-control task only (see Baumeister et al., 2006) or on aggressive behaviour only (Denson et al., 2011; Finkel et al., 2009); whereas in this study, self-control performance was measured *after* we measured aggressive behaviour.

It is also plausible that the crossover interaction occurred because participants who were at the same time experienced bolstered self-control resource (i.e., improved capacity in self-control following the training) might have simply chose to let go of any excessive controlled efforts (e.g., squeezing a handgrip for a lengthy period of time). The mindful capacity also includes observing one's own attempt to exert self-control and to let go of any thoughts, emotions, or desires that are less meaningful for oneself (see Brown et al., 2007a; Shapiro et al., 2006). Our next studies will test whether this phenomenon also occur when participants lack of self-control resource.

### 3.5.3 Strengths and limitations of the current study

An important limitation of the current study is that we only managed to retain data from 99 out of the optimum number of 128 participants (G*Power, 2013), mainly due to the high attrition rate from Time 1 to Time 2 of the study.

Heppner et al. (2008) have provided preliminary support for benefit of brief mindfulness inductions on direct provoked aggression. However, neither active control condition nor manipulation check was included in their work. In the current study, we found no significant differences between the mindfulness and relaxation conditions in terms of state mindfulness, as assessed by the Toronto Mindfulness Scale (TMS: Lau et al., 2006). Past study comparing a 1-month training in mindfulness and somatic relaxation (i.e., progressive muscle relaxation, simple breathing techniques, and guided imagery) showed that both training reduced distress and improved positive mood, but only mindfulness training reduced distractive and ruminative thoughts and behaviours (Jain et al., 2007). A longer period (7-week) of

both training also similarly increased well-being and reduced skin conductance responses to unpleasant stimuli, but reductions in the emotional interference from unpleasant stimuli were shown only by mindfulness trained participants (Ortner et al., 2007). Given that in this study the mindfulness and relaxation exercises were given only for 10 minutes, the time duration might not be strong enough to produce any differential effects. As no past laboratory work has used mindfulness of walking task before, we have no reference as to the immediate effect of this exercise, as well as the accountability of the TMS to capture this effect. In our next studies, we will employ a common method of laboratory inductions of mindfulness (i.e., mindfulness of breathing exercise) and a neutral condition for the control group that have been used in a recent study of mindfulness and ego-depletion by Friese et al. (2012).

We also cannot rule out the possibility that the efficacy of self-control training on direct aggression is due to a non-equal involvement between the self-control training and non self-control training participants. During the 2-week interim period, self-control training participants were contacted on a daily basis via email, whereas those in the no training group were only contacted immediately after completing the online survey, a week before the experiment, and approaching the day of the experiment. To keep experimenter contact equal, future work should incorporate a dummy communication for the control condition.

One limitation of the handgrip measure is that we did not assess the baseline duration for handgrip power, because we wanted to avoid the occurrence of ego-depletion effect. Given that that this task is sensitive to individual differences in physical hand strength (Muraven et al., 1999), participant' sex was assessed as an additional factor. Handgrip power may also be influenced by individual differences not measured in the current study. In our next studies, we will include the measure of baseline handgrip power, and used a manual hand exerciser instead of a digital one to allow a more precise determination of when the handgrip was released.

Despite the limitations, this study has provided a direct comparison for the efficacy of mindfulness and self-control interventions on reducing aggressive behaviour using

different types of aggression. Additionally, a behavioural measure of self-control performance as additional dependent variable was also entailed.

### 3.5.4 Conclusions and next steps

Findings from the current study reveal that reductions in aggressive *behaviour* could occur by experimentally manipulating individual's levels of mindfulness and self-control; however, this effect may vary for different types of aggression. Reduction in blast intensity following provocations was related to training in self-control, whereas mindfulness induction only reduced the more implicit form of aggression (i.e., the maximum blast latency for female participants). While the complementary effect of mindfulness and self-control was not shown on aggressive behaviour, a reverse effect was shown on self-control performance (i.e., handgrip power). Provided that the inconsistent role of mindfulness induction over self-control training is likely to occur due to participants' sufficient resources to perform self-controlled acts, the next studies will examine the effect of mindfulness induction on aggressive behaviour and self-control performance under ego-depletion condition.

# CHAPTER FOUR

# Study 3: Effect of mindfulness induction on the aggressive behaviour following depletion (British sample)

## 4.1 INTRODUCTION

In Study 2 (Chapter 3), the effect of a brief mindfulness induction on aggressive behaviour in the adapted TCRT (Taylor, 1967) task occurred only in the implicit form of aggression (i.e., the delay duration before the maximum aggressive response was delivered, particularly for females). By contrast, direct provoked aggression was effectively reduced by training in self-control. Individuals who performed both mindfulness induction and self-control training showed lower self-control performance (i.e., handgrip power) compared to those who performed one exercise only. Whether or not this inconclusive pattern of results was due to the individuals having sufficient resource to exert self-control is examined in this study. Specifically, we examine the moderating effect of mindfulness induction on the link between ego-depletion and aggressive behaviour and self-control performance. Importantly, to clarify the role of cultures on aggression, only native British individuals are recruited in the current study. The roles of individual differences in self-harm, sensitivity to provocations (SP) and frustrations (SF) are also assessed.

### 4.1.1 Self-control ego-depletion and aggressive behaviour

According to the strength model proposed by Baumeister and colleagues, performing self-control in one sphere depletes the common "resource" of self-control, resembling a muscle that gets tired after exertions (see Hagger et al.'s meta-analysis, 2010). This temporary state of diminished self-control strength is known as ego depletion. Under depleted state, people's ability to perform further, seemingly unrelated self-control acts is compromised.

In laboratory settings, ego-depletion is typically induced by the dual-task self-control procedure, using various spheres of self-control such as controlling attention, controlling emotions, controlling impulses, controlling thoughts, cognitive processing, choice and volition, and social processing (Baumeister, Vohs, et al., 2007). Participants in the depletion group are asked to perform two consecutive tasks requiring self-control, each task commonly lasts for 3 until 10 minutes (see Hagger et al., 2010). The first task serves as depleting task, the second one serves as dependent task. Control participants are also asked to perform two consecutive tasks, in which the first task is usually a less effortful version of the depleting task (so that participants can enact their impulsive responses), the latter task is the same dependent task as the depletion group. The strength model predicts that depleted participants would show impaired performance on the dependent task relative to control participants.

In the area of aggression, Stucke and Baumeister (2006) found that compared to non-depleted participants, depleted participants who resisted eating tempting food or stifled their physical and emotional reactions delivered more negative ratings to an experimenter that had previously insulted them, independent of mood, anger, or frustration due to depletion condition. De Wall et al. (2007) showed that higher aggressive responses in the TCRT task (as measured by the composite score of blast intensity and duration in the first unprovoked trial) or in candidate job evaluation were displayed by depleted participants *only* when they had been insulted, but not in the absence of insulting provocation. Similarly, depletion was also shown to increase aggression toward intimate partners only when partners had ostensibly provoked participants with negative feedback (Finkel et al., 2009). Altogether, these findings point out that the effect of *depleting* self-control resources may only manifest in aggressive *behaviour* if people encounter subsequent aggression-triggering events. In the same way, our result in Study 2 (Chapter 3) showed that the effect of *bolstering* self-control resources (i.e., via self-control training) in the reductions of aggressive behaviour only occurred in the presence of provocation.

Inconsistent role of provocations, however, was shown in Vohs et al.'s (2011) study using manipulations of depletion (emotion regulation while watching disgusting movie clip) and fatigue conditions (24 hours of total sleep deprivation). Rather than including insult as a method of provocation, the opponent's choice of blast intensity in the TCRT task (displayed as one unit higher than the participant set for the opponent) was used as a sole procedure to provoke aggression. Increases in blast intensity for depleted participants were found not only when they had received provocation from the opponent in the losing trials, but also during the initial *unprovoked* trial.

Whilst Vohs et al.'s work did not specifically address the role of provocation, it indicates that depletion may *directly* increase aggressive behaviour in the absence of provocation. Therefore, as in Study 2, the current study distinguishes blast intensity across three provocation levels in the TCRT task (i.e., no provocation, low provocation, and high provocation) and investigates whether *depleting* self-control capacity could increase aggressive behaviour. In this way, we can examine the effect of depletion on aggressive behaviour across provocation levels.

### 4.1.2 Role of mindfulness induction in counteracting the effect of depletion on aggressive behaviour

Outside the aggression literature, several variables (e.g., glucose, humour, laughter, and other positive emotions, cash incentives, implementation intentions, social goals) have been found to moderate the depletion effect on performance on self-control task (see Baumeister, Vohs, et al., 2007). However, none of these variables completely counteracted the depleted resource, and conversely may "all operate by inducing the person to expend more of the depleted resource" (Baumeister, Vohs, et al., 2007, p.353). In the current study, we examine whether a brief period of mindfulness induction may be a further way to counteract the effect of depletion on aggressive behaviour and self-control performance.

Of particular relevance is Friese, Messner and Schaffner's (2012) experiment using a 5 min period of mindfulness meditation. Sixty-six participants, approached at the end of the second day of a 3-day introductory seminar on mindfulness meditation in German and Swiss cities, were assigned to one of three conditions: emotion suppression (induced by disgusting movie clip), no emotion suppression (in which participants were asked to watch the same movie clip while allowing all emotions that may arise), and emotion suppression plus mindfulness meditation. As predicted, participants who had meditated after emotion suppression task performed better on subsequent self-control task (i.e., the crossing-out-letters task to discriminate between adjacent and similarly looking, but slightly different letters) than those in the suppression condition and equally well as those not suppressing emotion. The current study aims to test whether the moderating effect of mindfulness induction following depletion also applies on aggressive behaviour. We extend Friese et al.'s (2012) work via a fully crossed between subjects design (mindfulness x depletion).

Friese et al. (2012) suggested that the benefit of mindfulness on self-control performance following depletion may be attributable to increase self-awareness and a feeling of deep relaxation associated with mindfulness. As presented in Chapter 1, a depletion effect on aggressive behaviour may also be attenuated by the mindful reduction in emotional reactivity to aversive or emotionally provocative stimuli. In the current study, this proposed effect is tested under provoked and unprovoked aggression in the TCRT task. As in Study 2 (Chapter 3), we assess the maximum blast latency (the number of trials participants waited before delivering the maximum blast) as a measure of how long individuals can inhibit a desire to retaliate at maximum level, and participants' anonymous reputation damage of the opponent to provide alternative ways of aggression measures (see Giancola & Parrot, 2008).

In addition, to assess the broader influence of mindfulness on self-control, we measure the effect of mindfulness induction on self-control performance (i.e., handgrip task) at two time points: prior to the provocation procedure and after the

provocation procedure. In line with Study 1 and 2, we include measures of individual differences in mindfulness, self-control, aggression, self-harm, SP and SF.

## 4.2 HYPOTHESES

The current study predicts that:

1. Compared to ego-depleted participants, those non ego-depleted will:
    a. Deliver lower levels of blast intensity to the opponent, particularly on low provocation trials. No strong prediction is made regarding the levels of blasts delivered under no provocation or high provocation trials.
    b. Wait longer before delivering the maximum blasts to the opponent.
    c. Deliver lower ratings of anonymous reputation damage to the opponent.
2. Mindfulness induction will moderate the effect of ego-depletion on aggressive behaviour. Specifically, compared to depleted participants without mindfulness induction, depleted participants who receive mindfulness induction will:
    a. Deliver lower levels of blast intensity to the opponent particularly on low provocation trials. No strong prediction is made under no provocation or high provocation trials.
    b. Wait longer before delivering the maximum blasts to the opponent.
    c. Deliver lower ratings of anonymous reputation damage to the opponent.
3. The moderation of mindfulness on the ego-depletion and aggressive behaviour link will persist after accounting for the potential influence of individual differences in mindfulness, self-control, aggression (i.e., trait aggression, sensitivity to provocations [SP] and frustrations [SF]), sex, and self-harm.

In addition, we predict that:

4. Mindfulness induction will moderate the effect of ego-depletion on self-control performance, as measured by the changes in handgrip stamina after accounting for covariates:

a. Prior to the provocation procedure
b. After the provocation procedure

Given that the effect of mindfulness induction may not be salient when individuals have sufficient self-control resources (i.e., not ego depleted, See Chapter 3), no prediction is made for the main effect of mindfulness induction on aggressive behaviour and self-control performance.

Altogether, we hypothesise that that ego-depletion will predict higher levels of aggression and impaired self-control (handgrip) performance amongst participants not receiving mindfulness induction but not amongst participants receiving mindfulness induction, after accounting for covariates (personality variables).

## 4.3 METHODS

### 4.3.1 Participants

A total of 118 native British participants (110 from the University of Nottingham [UoN] and 8 from Nottingham Trent University [NTU]) participated in the study. Based on sex, participants were randomly assigned to one of four group (see details in the next section). Eight participants were discarded from final analysis due to: expressing spontaneous suspicions regarding the TCRT task (5 participants), data collection stopped prematurely due to computer error while performing the TCRT program (1 participant), and expressing confusion with the mindfulness induction procedure after they had performed the task (2 participants), resulting in 110 participants (58 females). Participants' mean age was 19.52 (*SD* = 2.03). Concerning current mindfulness practice, 92.7% participants reported never having encountered mindfulness, 6.4% practised them once a year, 1% (1 participant) on monthly basis, and none practised them on weekly or daily basis. The experiment lasted from October until November 2012.

### 4.3.2 Design

We used a fully-crossed 2 (ego-depletion task vs. no depletion) x 2 (mindfulness induction vs. no induction) between subjects experimental design in the current study. A stratified sampling technique was also employed to control the effect of sex (see Figure 4.1 for flow of participants).

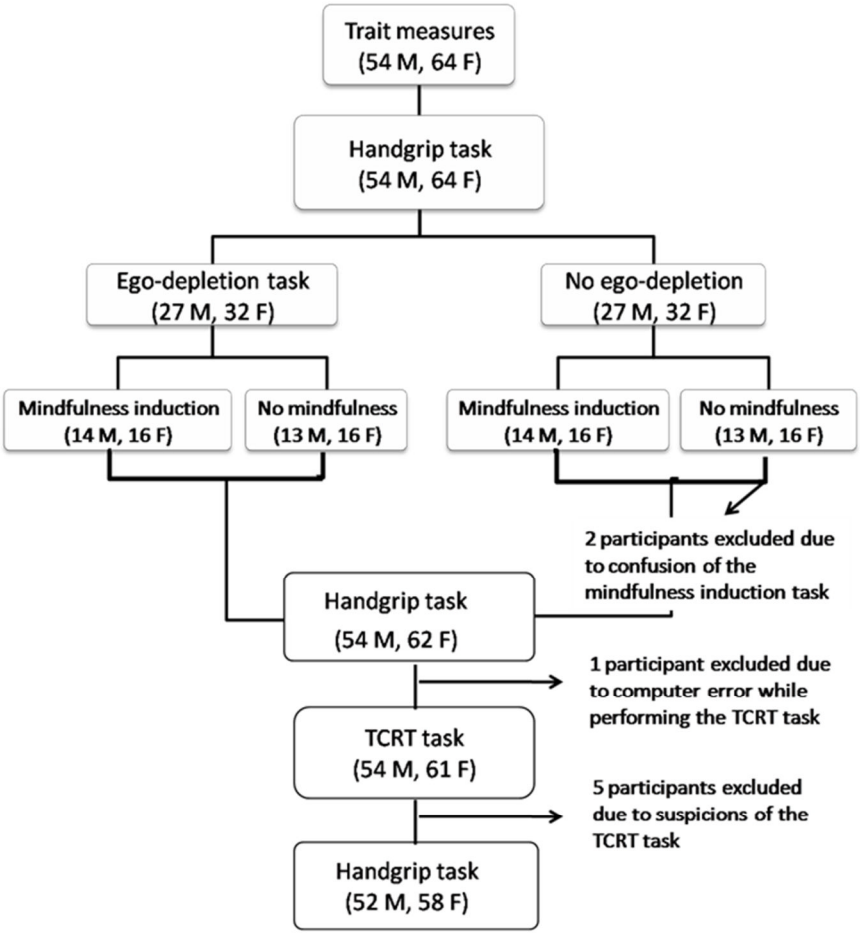


Figure 4.1. Flow of participants through Study 3.
*Note.* M = Males; F = Females

### 4.3.3 Trait and state measures

The self-reported measures in Study 1 and 2 (Appendix 2.1) were employed to assess individual differences in mindfulness (Mindfulness Attention Awareness Scale [MAAS]: Brown & Ryan, 2003), self-control (Self-Control Scale [SCS]: Tangney et al.,

2004), aggression (Aggression Questionnaire [AQ]: Buss & Perry, 1992), sensitivity to frustrations and provocations (Situational Triggers of Aggressive Responses [STAR] scale: Lawrence, 2006), and self-harm (Deliberate Self-Harm Inventory [DSHI]: Gratz, 2001). See Section 2.3.3 (Chapter 2) for the full description of the trait measures.

As in Study 2, we replaced the measure of anxiety and depression (Hospital Anxiety and Depression [HADS]: Zigmond & Snaith, 1983) from Study 1 with the mood measure (Positive Affect, Negative Affect Schedule [PANAS]: Watson et al, 1988). The PANAS was given twice: following depletion task and following the TCRT task.

The efficacy of the mindfulness induction was assessed using Toronto Mindfulness Scale (TMS: Lau et al., 2006), compromising mindfulness state of curiosity and decentering. Description of the TMS is presented in section 3.3.3, Chapter 3 (see Appendix 3.1 for the PANAS and TMS).

The efficacy of the depletion manipulation was assessed with two following questions (i) "How difficult was it for you to follow the instructions during the video clip", and (ii) "How much you had to control your attention to follow the instructions during the video clip", on a 7 point Likert-scale (1 = *not at all* and 7 = *very much*). A higher score would indicate higher levels of depletion.

### 4.3.4 Experimental manipulations

#### 4.3.4.1 Ego-depletion task

Ego-depletion was induced using the dual-task self-control procedure (see section 4.1.1), in which participants in the depletion group were asked to perform two consecutive tasks requiring self-control, whereas participants in the control condition (no depletion) were also asked to perform two consecutive tasks, but only the second task required self-control. For the first self-control task, we used an attention control procedure that has been used in previous aggression experiments (e.g., DeWall et al., 2007; Finkel et al., 2009). Specifically, all participants were asked

to watch a 6-min videotape (without audio) depicting a woman being interviewed by an off-camera interviewer, and were told that they would later be making person perception judgments of the interviewee. In addition to the women being interviewed, a series of common one-syllable words (e.g., *glue, tire, book*) appeared at the bottom of the screen for 10 s each. Participants in the depletion condition were instructed "not to read or look at any words that may appear on the screen", and to redirect their gaze immediately if they caught themselves looking at the words instead of the woman's face. Participants in the no depletion condition were not given any instructions and were not told in advance that there would be words at the bottom of the screen.

For the second self-control task, we used performance in a hand-grip task (discussed in the latter part of this section).

#### 4.3.4.2 Mindfulness induction

For the mindfulness induction, we used Mark Williams' audio instruction for "Mindfulness of body and breath" (Williams & Penman, 2011; see Appendix 4.1), typically used in the MBCT course (Oxford Mindfulness Centre, 2002; see also Kramer, Weger, & Sharma, 2013). Participants were guided with an audio commentary to direct their attention towards witnessing the full sensations of breathing and to observe them without the intention of altering them. They were also told to notice in an accepting manner when their minds wander and gently return their focus to the sensations of breathing. Variants of these instructions were repeated every 60 s for 15 minutes.

For the control condition, we used a neutral educational information. Participants listened to two educational excerpts and completed a word search puzzle for a total 15 minutes. A similar procedure has been used elsewhere (Erisman & Roemer, 2010) as a control condition for the effect of mindfulness condition on emotion regulation.

#### 4.3.4.3 Direct aggressive behaviour

Participants' direct aggressive behaviour was assessed using the adapted Taylor Competitive Reaction Time (TCRT: Taylor, 1967; for a complete description see section 3.3.4.3, Chapter 3). The TCRT task has been employed in studies measuring the effect of depletion (e.g., De Wall et al., 2007; Finkel et al., 2009; Vohs et al., 2011) and mindfulness (Heppner et al., 2008) on aggressive behaviour.

As in Study 2, participants experienced no provocation, low provocation, and high provocation trials. The blast intensities delivered to the opponent under these three trials were used as a measure of direct aggression. The maximum blast latency (the number of trials participants waited before delivering the maximum blast) was also used as an additional measure of direct aggression.

#### 4.3.4.4 Indirect aggression

As in Study 2, indirect aggression was assessed with five ratings of the opponent's reputation damage (i.e., opponent's aggressiveness, skill, competitiveness, and fairness, and participants' willingness to play with the same opponent again in future paid studies) on a 7-point scale (1 = *completely disagree* and 7 = *completely agree*).

#### 4.3.4.5 Self-control performance

A handgrip task was used to measure self-control performance following depletion (see Hagger et al., 2010). To allow a more precise determination of when the handgrip was released, we replaced the digital handgrip in Study 2 with a manual hand exerciser (consisting of two handles and a metal spring) and inserted a small wad of paper between the far end of the handles. Self-control performance was measured by the duration of time the participant was able to continuously squeeze the handgrip using the dominant hand until the wad fell out.

Each participant was asked to perform the handgrip task three times (i) at the beginning of the study (baseline handgrip stamina), (ii) immediately following the mindfulness induction (as a measure of performance in the second self-control task), and (iii) at the completion of the study (to test whether the effect of mindfulness induction would persist). Self-control performance was calculated twice as the changes in handgrip duration compared with baseline duration.

### 4.3.5 Power calculation

A similar previous study (Friese et al., 2012) of the effect of mindfulness induction on self-control performance following ego-depletion assigned 66 participants to one of three conditions (i.e., *no depletion*, *depletion*, and *depletion plus mindfulness*). Thus an additional 22 participants (88 in total) would be necessary for four conditions in the current study. When calculated with G*Power 3 (2013), a total 128 participants is required to detect a medium effect ($d$ = .25) for four group and 1 covariate (sex), and given the power of .80 and an alpha level of .05. Based on these considerations, the current study would require between 22 to 32 participants (11 to 16 males or females) for each group.

### 4.3.6 Procedure

Potential participants from University of Nottingham (UoN) were contacted via posters/leaflets on the university campus and departmental mailing lists (Appendix 4.2). Those from Nottingham Trent University [NTU]) were recruited by asking the researcher's colleagues (NTU students) to help distribute the leaflets around their campus. Participants were told the study investigated the effects of personality traits and experimental treatments on the way people perform in a competitive reaction-time task. To be able to participate, they have to speak British English as their first language. They were given a £5 inconvenience allowance and a chance to win £50

incentive for the fastest participants' reaction-time across the entire study. Alternatively, experimental credit points were given for UoN Psychology students signing up via the Research Participation Scheme.

Participants came into the lab in the School of Pychology. At first, information about the study was presented (Appendix 3.8). After giving informed consent (Appendix 3.9), they were asked to provide demographic information (i.e., sex, age, current mindfulness practice) and completed an online questionnaire of the trait measures (Appendix 2.1). Immediately after the trait measures, participants were asked to furnish a baseline handgrip measure. The experimenter stopped the stopwatch as soon as the wad inserted between the grip handles fell out.

Next, all participants were asked to watch the 6 min attention control videotape. Participants were left alone to do this task and were asked to open the cubicle when they had finished watching the video clip. The experimenter then returned to the cubicle and asked participants to complete two questions measuring the effectiveness of the depletion procedure, three dummy questions about the person perception judgments of the interviewee on the videotape, and the first PANAS (Watson et al., 1988),

Half of the participants in the ego-depletion group and half of those in the no-depletion condition were then given a mindfulness induction task, while the rest of the participants were given the neutral education information. Then the experimenter left the room again, while participants listened to and practised the appropriate audio guided instruction for 15 minutes. When the participant opened the cubicle door, the experimenter entered the cubicle and asked participants to complete the TMS (Lau et al., 2006), followed by a handgrip task.

Next, the participants were told that the experimenter needed to prepare their TCRT opponent. After leaving the room for a while (ostensibly to prepare the opponent), the experimenter returned. Participants were then left alone to perform the TCRT task. When the participant opened the cubicle door to indicate the end of the TCRT

task, the experimenter asked the participants to complete the second PANAS and perform a final measure of handgrip stamina. Finally participants were debriefed and given help and support information (Appendix 3.10).

### 4.3.7 Data analysis

Statistical analyses were performed on the data using IBM SPS statistics 20.0 (2011). First, associations between personality variables, and between personality variables and the experimental outcomes (i.e., aggressive behaviour and self-control performance) were examined using zero-order correlations or independent *t*-tests (for sex and self-harm). The efficacy of the experimental conditions was assessed using independent *t*-tests or one-way ANOVAs.

#### 4.3.7.1 Moderation of mindfulness induction on the link between depletion and aggressive behaviour

For the primary hypotheses, we used self-control ego-depletion as the predictor, mindfulness induction as the moderator, and aggressive behaviour as the outcome. Aggressive behaviour was measured in terms of (i) blast intensity on no provocation, low provocation, high provocation (Hypothesis 2a), (ii) maximum blast latency (Hypothesis 2b), and (iii) indirect aggression ratings/damage to opponent's reputation (Hypothesis 2c). For Hypothesis 2a and 2c, the moderating effect of mindfulness induction on the link between self-control ego depletion and aggressive behaviour is tested with a bootstrapping method, using model "number 1" in the A. F. Hayes's (2012a) PROCESS macro for simple moderation (explanation for this model can be found in section 2.3.6, Chapter 2). Hypotheses 2a and 2c would be supported if the interaction coefficient between depletion and mindfulness induction is statistically different from zero. Specifically for Hypothesis 2c (five items

of indirect aggression), we tested if the effect would survive Bonferroni corrections set at $p$ <.05 /5 items, or $p$ < .01.

Hypothesis 2b would be supported if the interaction between mindfulness and depletion significantly predicts the maximum blast latency (i.e., the number of trials participants waited before delivering the maximum blast). To test this prediction, we conducted a censored survival analysis using Cox regressions to assess the extent to which participants would be more likely to administer the maximum blast to the opponent as a function of experimental conditions.

Hypothesis 1a, 1b, and 1c would be supported if there is a significant main effect of depletion on blast intensity, maximum blast latency, and ratings of the opponent.

To provide support for Hypothesis 3, the moderation models were repeated while accounting for the influence of the hypothesised covariates based on the prior significant zero-order correlations between covariates and aggressive behaviour.

#### 4.3.7.2 Moderation of mindfulness induction on the link between depletion and self-control performance

The moderating role of mindfulness induction on the link between ego-depletion and self-control performance were also examined using bootstrapping method. Self-control ego-depletion was used again as the predictor, mindfulness induction as the moderator, and self-control performance as the outcome. Specifically, self-control performance was measured in terms of (i) Change 1 (changes in handgrip duration prior to the TCRT task relative to baseline), and (ii) Change 2 (post-TCRT task handgrip duration relative to baseline). We expected that the interaction coefficient between depletion and mindfulness induction on Change 1 (Hypothesis 4a) and Change 2 (Hypothesis 4b) would be statistically different from zero after accounting for the potential influence of the hypothesised covariates, based on the prior significant zero-order correlations between covariates and self-control performance.

## 4.4 RESULTS

### 4.4.1 Baseline levels

To ensure that our randomisation procedure was successful, the means of trait measures were compared for each group (i.e., depletion plus mindfulness, depletion no mindfulness, no depletion mindfulness, no depletion no mindfulness). The group were not significantly different from each other in any of the self-reported trait measures $p$ =.13 to .96). Due to the small number of participants who reported having had experience with mindfulness practice (only 1 participant currently practised mindfulness on monthly basis), we did not carry out any comparisons based on this factor.

### 4.4.2 Preliminary analysis

Table 4.1.
*Zero order correlations and psychometric properties of measures*

| Measures | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| MAAS (1) | 1.00 | | | | | | | | |
| SCS (2) | .47*** | 1.00 | | | | | | | |
| Total AQ (3) | -.38*** | -.47*** | 1.00 | | | | | | |
| AQ Physical (4) | -.17 | -.24* | .69*** | 1.00 | | | | | |
| AQ Verbal (5) | -.17 | -.30** | .75*** | .31** | 1.00 | | | | |
| AQ Anger (6) | -.37*** | -.42*** | .76*** | .40*** | .45*** | 1.00 | | | |
| AQ Hostility (7) | -.43*** | -.43*** | .70*** | .26** | .39*** | .42*** | 1.00 | | |
| STAR Provocations (8) | -.26** | -.31** | .59*** | .35*** | .36*** | .52*** | .50*** | 1.00 | |
| STAR Frustrations (9) | -.32** | -.21* | .46*** | .14 | .27** | .55*** | .43*** | .76*** | 1.00 |
| *M* | 3.72 | 3.05 | 2.43 | 2.04 | 2.88 | 2.22 | 2.59 | 2.88 | 2.54 |
| *SD* | .67 | .56 | .57 | .83 | .84 | .72 | .79 | .78 | .76 |
| αCronbach | .84 | .77 | .89 | .87 | .77 | 79 | .78 | .89 | .86 |

*Note*. MAAS = Mindful Attention Awareness Scale; SCS = Self-Control Scale; AQ = Aggression Questionnaire; STAR = Situational Triggers of Aggressive Responses
*$p$ < .05; **$p$ < .01; ***$p$ < .001

Table 4.1 presents the zero-order correlations amongst trait measures and descriptive statistics ($N$ = 110). Internal reliabilities of measures were good ($\alpha$ = .77 to .89). Trait mindfulness and trait self-control were positively correlated to each

other and negatively correlated to most of the aggression measures, replicating the findings of Study 1 and 2.

A series of independent samples *t*-test revealed some significant sex differences in trait variables. Compared to females (*n* = 58), males (*n* = 52) scored significantly higher on physical aggression (*t*(9.34) = 3.21, *p* < .01; *M* males = 2.30, *SD* = .77 vs. *M* females = 1.82, *SD* = .65) and significantly lower on sensitivity to frustrations (SF: *t*(108) = -2.45, *p* <.05; *M* males = 2.36, *SD*= .76 vs. *M* females = 2.71, *SD* = .72). No significant differences were found between self-harmers (*n* = 11) and non self-harmers (*n* = 99) in any of the trait measures (*p* = .10 to .92). None of the associations were significantly altered when we broke down the effect based on sex (*r* = -.18 to .80) or self-harm (*r* = .13 to .77).

### 4.4.3 Zero-order correlations between personality variables and experimental outcomes

Table 4.2 shows the associations between personality variables and (i) direct aggression: blast intensity on each provocation level and maximum blast latency, (ii) indirect aggression, and (iii) self-control performance/handgrip stamina: Change 1 (changes in pre-TCRT task handgrip duration), and Change 2 (changes in post-TCRT task handgrip duration). Specifically for testing Hypothesis 3 and 4, significantly associated personality variables would be controlled in further analyses.

#### 4.4.3.1 Associations with direct aggression

Resembling the findings from Study 2, sensitivity to provocations (SP) was positively associated to provoked direct aggression, but not to unprovoked direct aggression. Males responded with higher blast intensity than females following low provocation, but not under high provocation; whereas sex differences on no provocation were

approaching significant (see Table 4.3). Direct aggression did not differ as a function of self-harm status ($p$ = .18 to .90).

Examining those who delivered a maximum blast during the TCRT, those higher in physical aggression delivered the maximum blasts to the opponent sooner. Interestingly, females ($n$ = 36) relative to males ($n$ = 41), also delivered the maximum blast earlier in the TCRT ($t$(75) = 3.59, $p$ < .001; $M$ males = 8.95, $SD$ = 8.13 vs. $M$ females = 16.56, $SD$ = 10.43). No differences were found between self-harmers ($n$ = 8) and non self-harmers ($n$ = 69; t(75) = .30, $p$ = .77) on maximum blast latency.

#### 4.4.3.2 Associations with indirect aggression

It can be seen from Table 4.2 that traits mindfulness and self-control were only negatively associated to the rating of opponent fairness. Rating of this item was also related, positively, to sensitivity to provocations and frustrations. Self-harmers also rated the opponent as significantly more fair than non self-harmers ($t$(19) = 2.45, $p$ < .05; $M$ self-harmers = 5.27, $SD$ = .91 vs. $M$ non self-harmers = 4.48, $SD$ = 1.69). Negative affect was negatively correlated with ratings of opponent's skilfulness and of participants' willingness to take a part in against the same opponent again. No sex differences ($p$ = .06 to 50) were found in any ratings of indirect aggression.

#### 4.4.3.3 Associations with self-control performance

Self-control performance (i.e., handgrip stamina) was negatively associated with physical aggression. Females were more able to maintain their baseline handgrip stamina than males in Change 1 ($t$(79.06) = 3.84, $p$ < .0001; $M$ male = -16.25, SD = 22.49 vs. $M$ female = -3.02, SD = 12.83) and Change 2 ($t$(73.31) = -2.43, $p$ < .05; $M$ male = -12.87, $SD$ = 22.34 vs. $M$ female = -4.54, $SD$ = 11.22). No significant differences between self-harmers and non self-harmers in handgrip stamina was observed in Change 1 ($t$(108) = -1.20, $p$ = .23) or Change 2 ($t$(108) = -.08, $p$ = .94).

Table 4.2.

*Zero order correlations of personality measures, aggressive behaviour, and self-control performance*

| Measures | Blast intensity based on levels of provocation | | | Max. blast latency | Rating indirect aggression | | | | Play again | Handgrip stamina | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | No | Low | High | | Aggressive | Skilful | Competitive | Fair | | Change 1 | Change 2 |
| MAAS | -.02 | -.06 | -.05 | -.08 | .13 | .08 | -.08 | -.20* | -.05 | -.06 | -.07 |
| SCS | .02 | -.06 | -.06 | .05 | .06 | -.09 | .01 | -.22* | -.09 | -.19* | -.08 |
| AQ Total | -.09 | .10 | .11 | -.10 | .07 | .19* | .14 | .03 | .03 | .01 | -.11 |
| AQ Physical Aggression | -.05 | .20* | .25** | -.26* | .01 | .19 | -.01 | -.01 | .08 | -.18 | -.28** |
| AQ Verbal Aggression | -.03 | .04 | .00 | -.15 | .10 | .20* | .15 | -.02 | .06 | .06 | -.01 |
| AQ Anger | -.09 | -.01 | .00 | .04 | -.01 | .07 | .12 | .05 | .02 | .04 | -.07 |
| AQ Hostility | -.09 | .04 | .06 | .13 | .09 | .09 | .15 | .08 | -.08 | .10 | .06 |
| STAR Provocation | .04 | .23* | .19* | -.05 | -.01 | .01 | .01 | .23* | .03 | .07 | .01 |
| STAR Frustration | .03 | .18 | .12 | .05 | -.03 | .00 | .00 | .20* | .03 | .11 | -.01 |
| TMS Curiosity | .12 | .18 | .20* | -.10 | -.05 | .01 | -.14 | .13 | .22* | -.04 | .03 |
| TMS Decentering | .05 | .08 | .08 | .08 | -.02 | .13 | .09 | .13 | .12 | .04 | .07 |
| PANAS PA1 | .04 | .08 | .10 | -.10 | -.08 | -.03 | .04 | .08 | .18 | -.12 | -.01 |
| PANAS NA1 | .07 | .10 | -.01 | -.03 | -.09 | -.25** | .09 | .01 | -.32** | .06 | .09 |
| PANAS PA2 | .03 | .05 | .06 | -.01 | -.07 | .02 | .13 | .03 | .12 | -.08 | .03 |
| PANAS NA2 | -.02 | .24* | .20* | -.10 | -.05 | -.18 | .00 | .13 | -.09 | -.03 | -.18 |

*Note.* MAAS = Mindful Attention Awareness Scale; SCS = Self-Control Scale; AQ = Aggression Questionnaire; STAR = Situational Triggers of Aggressive Responses; TMS = Toronto Mindfulness Scale, PANAS 1 = Positive Affect Negative Affect following depletion; PANAS 2 = Positive Affect Negative Affect post-TCRT task

All correlations were based on $N$ = 110, except for maximum blast latency. The correlations for maximum blast latency was made only for participants who delivered a maximum blast ($N$ = 77).

*$p < .05$; **$p < .01$; ***$p < .001$

### 4.4.4 Manipulation checks

The depletion manipulation was partly effective. Participants in the attention control (depletion) condition (*n* = 55) reported having controlled their attention to a greater extent than no control participants (*n* = 55; *t*(108) = 2.26, *p* < .05; *M* attention control = 4.91, *SD* = 1.78 vs. *M* no control = 4.20, *SD* = 1.50), but did not rate the task as more difficult than those in the no-control condition (*t*(108) = -.42, *p* = .68; *M* attention control = 3.31, *SD* = 1.95 vs. *M* no control = 3.45, *SD* = 1.69).

Participants in the mindfulness breathing (*n* = 55) reported higher decentering than no induction participants (*n* = 55; *t*(108) = 2.65, *p* < .05; *M* mindfulness induction = 3.03, *SD* = .60 vs. *M* no induction = 2.70, *SD* = .70), but did not show higher levels of Curiosity (*t*(117) = 1.15, *p* = .25; *M* mindfulness induction = 3.50, *SD* = .81 vs. *M* no induction = 3.31, *SD* = .88). Both mindfulness subscales shown good internal consistency ($\alpha$ = .84 and .71 for curiosity and decentering, respectively) and were positively correlated (*r* = .58, *p* < .0001).

Following the attention control task, participants in the depletion condition reported higher PA than non-depleted ones (*t*(108) = 2.24, *p* < .05; *M* attention control = 2.66, *SD* =.68 vs. *M* no control = 2.37, *SD* = .70), but not higher NA (*t*(108) = .57, *p* = .57; *M* attention control = 1.26, *SD* =.38 vs. *M* no control = 1.23, *SD* = .24). Both mood subscales immediately following the attention control task showed good internal consistency ($\alpha$ = .87 and .72 for PA and NA, respectively) but were not significantly correlated (*r* = .14, *p* = .15).

It should be noted that ego-depletion studies generally demonstrate no relationship between depletion and mood, although at times there is an increase in negative affect due to the aversiveness of depleting tasks (see Hagger et al., 2010). In contrast, the current participants reported significant postdepletion increases in PA, indicating that they might have seen the task as being more interesting. Importantly, however, PA was not correlated to aggression (see Table 4.2, section 4.4.3.1). So any

differences in the experimental outcomes would not be related to differences in participant's mood following depletion.

Both mood subscales also showed good internal consistency ($\alpha$ = .91 and .77 for PA and NA, respectively) and were positively correlated ($r$ = .63, $p$ < .0001) when given following the TCRT task. No differences were found between the four between subjects group on PA ($F$(3,106) = .63, $p$ = .60) or NA ($F$(3,106) = .45, $p$ = .72).

### 4.4.5 Moderation of mindfulness induction on the link between depletion and direct aggression

#### 4.4.5.1 Levels of blast intensity

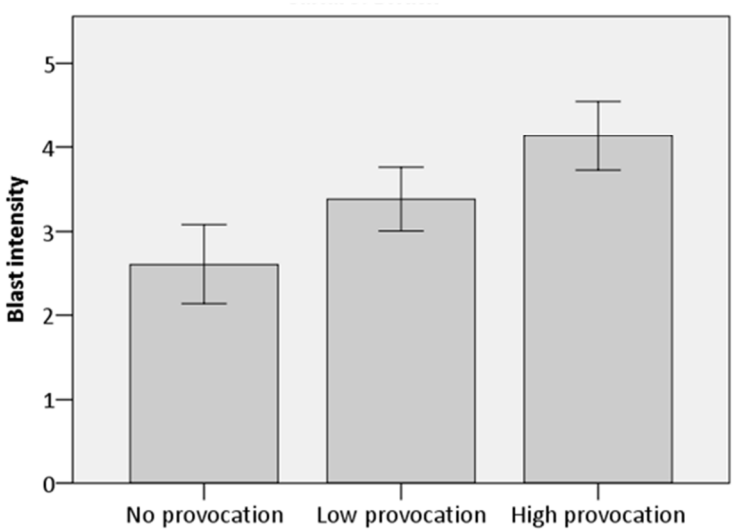


Figure 4.2. Effect of level of provocations on blast intensity.
Error bars indicate standard error of mean. Scale goes up to 8 as a maximum.

As typically found in studies varying provocation from the opponent (e.g., Anderson et al., 2008; Lawrence & Hutchinson, 2013a, 2013b; see also Study 2 in Chapter 3), intensity was significantly affected by level of provocations ($F$(1.31, 142.94) = 42.15, $p$ < .001; Figure 4.2). Specifically, participants delivered more intense blasts on high provocations ($M$ = 4.14, $SD$ = 2.17) compared to low provocations ($M$ = 3.38, $SD$ =

2.00; $p < .0001$), and on low provocation compared to no provocation ($M = 2.61$, $SD = 2.50$; $p < .0001$).

A comparable pattern of results was revealed when we performed a 2 (sex) by 3 (provocation level) mixed analysis ANOVA, in which blast intensity was still affected by level of provocations ($F(1.31, 141.01 = 41.40$, $p < .001$), but not by its interaction with sex ($F(1.31, 141.01) = 1.09$, $p = .32$). The main effect of sex is shown in Table 4.3, in which males delivered a significantly higher blast than females following low provocation. Sex differences on no provocation were approaching significance.

Table 4.3.
*Sex differences on blast intensity on each provocation level*

| Level of provocations | Males ($n$ = 52) | Females ($n$ = 58) | $t$ |
|---|---|---|---|
| | $M$ ($SD$) | $M$ ($SD$) | |
| No provocation | 3.08 (2.89) | 2.21 (2. 03) | $t(90.31) = 1.80$, $p = .08$ |
| Low provocation | 3.82 (2.24) | 3.00 (1.69) | $t(94.26) = 2.13$* |
| High provocation | 4.35 (2.29) | 3.94 (2.06) | $t(108) = .98$, $p = .33$ |

$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

The moderation model was tested across three provocation levels, using a bootstrapping method, with 95% bias-corrected confidence intervals (based on 5,000 bootstrap resamples, $N$ = 110). All predictors were mean-centered. Results in Table 4.4 depict that Hypothesis 2a was partially supported such that there was significant effect of mindfulness induction on the link between depletion and blast intensity under no provocation and low provocation, but not under high provocations. In other words, under no provocation and low provocation, depleted participants who received mindfulness induction delivered lower levels of blast intensity than depleted ones with no induction; whereas non-depleted participants with mindfulness induction displayed comparable blast intensity with non-depleted ones with no induction (See Figure 4.3). Additionally, depletion (Hypothesis 1a) and mindfulness influenced unprovoked, but not provoked direct aggression. Specifically,

those who were depleted or did not received mindfulness induction delivered higher levels of blast intensity under no provocation only.

Table 4.4.
*Moderation models with bootstrapping method, using depletion as predictor, mindfulness as moderator, blast intensity as outcome*

| Model tested | No provocation | | Low provocation | | High provocation | |
|---|---|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* | *B* | *SE* |
| Depletion ($c_1$) | 1.24** | .45 | .62 | .37 | .42 | .41 |
| Mindfulness induction ($c_2$) | -.95* | .45 | -.62 | .37 | -.62 | .41 |
| Depletion x mindfulness ($c_3$) | -1.90* | .90 | -1.55* | .74 | -1.25 | .82 |
| $R^2$ on interaction | 3.63%* | | 3.79%* | | 2.07% | |
| Conditional effect of depletion without mindfulness | 2.19*** | .64 | 1.40** | .52 | | |
| Conditional effect of depletion with mindfulness | .29 | .64 | -.15 | .52 | | |

*Note. B* = unstandardised regression coefficient; *SE* = standard error; $R^2$ = variance increase
*$p < .05$; **$p < .01$; ***$p < .001$

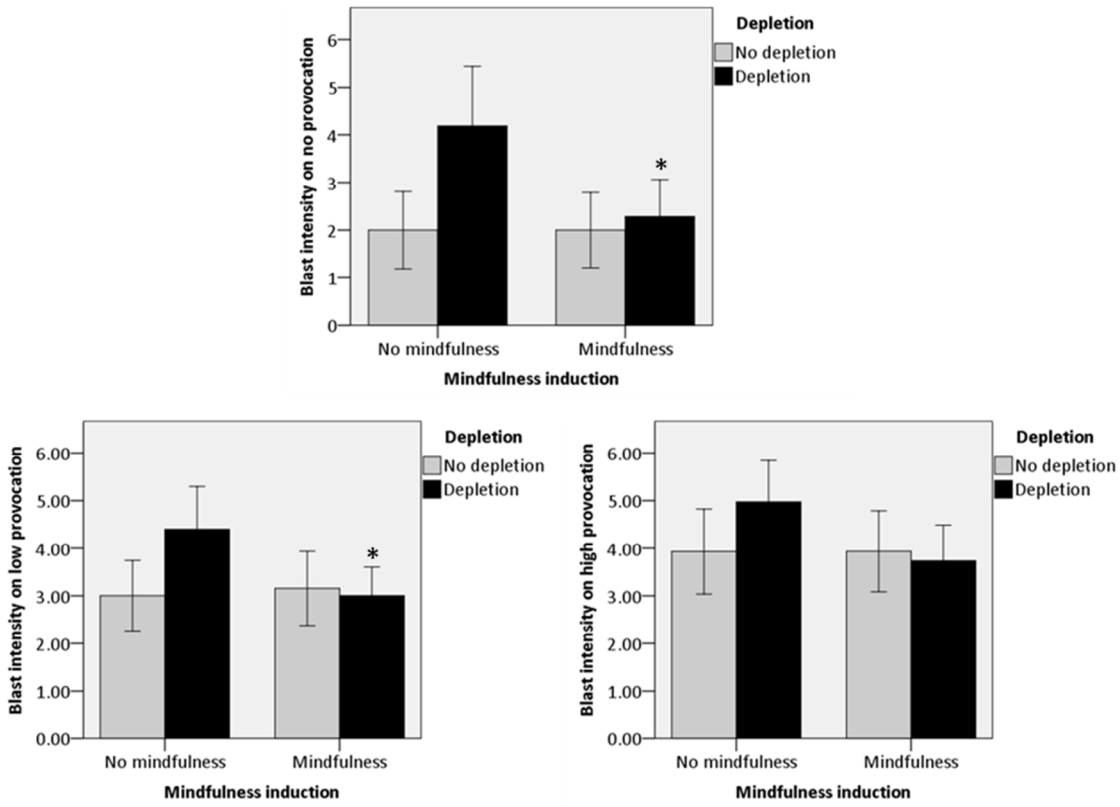


Figure 4.3. Mindfulness × depletion effect on blast intensity across provocation levels. Error bars indicate standard error of mean, asterisk indicates significant ($p < .05$) decrease in blast intensity. Scale goes up to 8 as a maximum.

As no personality variables were significantly associated with blast intensity under no provocation (see Table 4.2), the moderation analysis was repeated only for blast intensity delivered under provoked aggression. For clarity of presentation, the partial effects of covariates are presented separately (Table 4.5). Under low provocation, mindfulness continued to moderate the effect of depletion on blast intensity ($c_3$: *B* = -1.42, *SE* = .70, $p < .05$). The total variance uniquely attributable to the interaction slightly dropped from 3.79 to 3.13% ($F(1, 102) = 4.10$, $p < .05$). With the inclusion of SP, blast intensity on low provocation was affected by significant main effects of depletion ($c_1$: *B* increased from .62 to .73, $p < .05$), and mindfulness induction ($c_2$: *B* slightly dropped from -.62 to -.67, $p < .05$). Those higher in SP also delivered higher levels of blast intensity under low provocation.

Under high provocation, there was still no significant interaction effect ($c_3$: *B* = -.89, *SE* = .81, $p = .27$), main effect of mindfulness ($c_2$: *B* dropped from .42 to -.74, $p = .07$), or depletion ($c_1$: *B* increased from -.62 to -.67, $p = .10$) on blast intensity. The proportion of the total variance in the outcome due to the interaction dropped from 2.07% to 1.00% ($F(1, 102) = 1.22$). None of the hypothesised covariates significantly predicted blast intensity under high provocation.

Supporting Hypothesis 3, controlling for personality variables yielded a similar pattern of results for the moderation of mindfulness induction on the link between depletion and blast intensity on no provocation, and low provocation, but not on high provocation. In addition, depleted participants delivered higher blast intensities except on high provocation.

Table 4.5
*Partial effects of control variables for moderation models with bootstrapping method, using depletion as predictor, mindfulness as moderator, blast intensity as outcome*

| Covariates | Low provocation | | High provocation | |
|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* |
| Sex | -.67 | .38 | - | - |
| AQ Physical aggression | .19 | .25 | .48 | .26 |
| STAR Provocations | .55* | .25 | .29 | .28 |
| TMS Curiosity | - | - | .35 | .25 |

| Covariates | Low provocation | | High provocation | |
|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* |
| PANAS NA2 | .68 | .49 | .57 | .55 |

*Note.* B = unstandardised regression coefficient; *SE* = standard error; $R^2$ = variance increase
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

#### 4.4.5.2 Maximum blast latency

During the TCRT, only 77 participants out of 110 delivered maximum blasts to the opponents. We firstly carried out censored survival analyses using Cox regressions to assess the extent to which individuals were more likely to administer the maximum blasts as a function of the experimental conditions. Our proposed model was not significant ($\Delta\chi^2 = 2.93$, $p = .40$). The likelihood of delivering the maximum blast to opponent was not predicted by mindfulness (Wald = 1.41, $p = .23$, CI [.34, 1.31], exp(*B*) = .6), depletion (Hypothesis 1b: Wald = .51, $p = .47$, CI [.42, 1.50], exp(*B*) = .79), or the interaction between mindfulness and depletion (Hypothesis 2b: Wald = 2.68, $p = .10$, CI [.85, 5.86], exp(*B*) = 2.24).

We repeated the censored survival analyses to assess the maximum blast latency as a function of the experimental conditions and the hypothesised covariates (i.e., sex and physical aggression). Our final model was significant ($\Delta\chi^2 = 17.63$, $p < .01$}, supporting Hypothesis 3. The point at which participants delivered the maximum blast to opponent was influenced by the interaction of mindfulness and depletion (Wald = 5.32, $p < .05$, CI [1.20, 8.86], exp(*B*) = 3.25) and the main effect of sex (Wald = 8.60, $p < .01$, CI [1.28, 3.41], exp(*B*) = 2.09). Interestingly, depleted participants with mindfulness induction, and females were more likely to administer the maximum blast during the TCRT. The influence of physical aggression was approaching significance (Wald = 3.79, $p = .052$, CI [1.00, 1.89], exp(*B*) = 1.37), but not the main effect of depletion (Wald = 2.13, $p = .14$, CI [.32, 1.18], exp(*B*) = .61) or mindfulness (Wald = 2.16, $p = .14$, CI [.29, 1.19], exp(*B*) = .60).

When we analysed the effect of mindfulness and ego depletion on maximum blast latency separately for males and females, the findings varied (Figure 4.4).

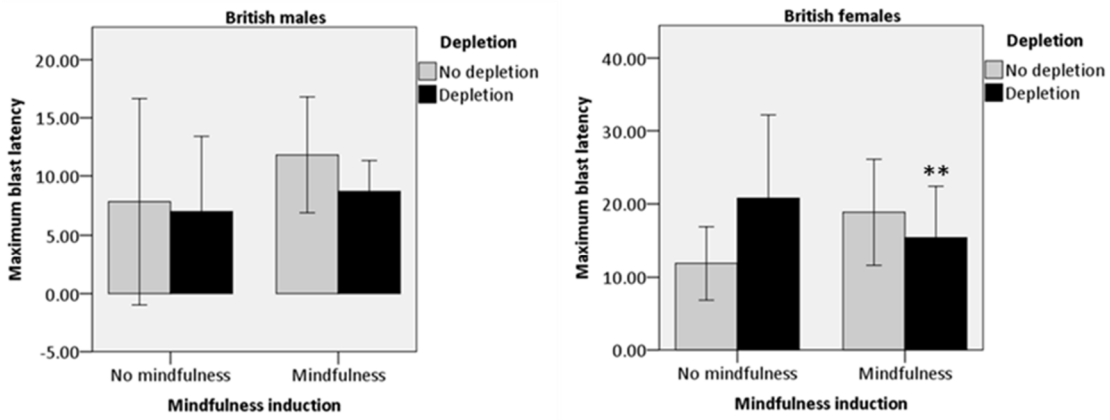


Figure 4.4 Sex differences in maximum blast latency. Error bars represent standard error of mean, asterisk indicates that participants delivered the maximum blast sooner ($p < .01$).

For females ($n$ = 36), the depletion x mindfulness induction model was significant ($\Delta\chi^2$ = 7.95, $p < .05$). Depleted females who received mindfulness induction were *more* likely to deliver the maximum blast (Wald = 5.81, $p < .01$, CI [1.42, 29.98], exp($B$) = 6.65). There were no significant main effects of depletion (Wald =.41, $p$ = .52, CI [.28, 1.92], exp($B$) = .73), or mindfulness induction (Wald = 3.40, $p$ = .07, CI [.11, 1.07], exp($B$) = .35) on maximum blast latency.

For males ($n$ = 41), the depletion x mindfulness induction model was not significant ($\Delta\chi^2$ = 1.19, $p$ = .76). Maximum blasts latency was not predicted by depletion (Wald = .58, $p$ = .45, CI [.30 to 1.71], exp($B$) =.71), mindfulness induction (Wald = .02, $p$ = .89, CI [.43, 2.64], exp($B$) = 1.06), or interaction between conditions (Wald = .24, $p$ = .62, CI [.37, 5.31], exp($B$) = 1.40).

#### 4.4.5.3 Correlation between blast intensity and maximum blast latency

For participants who had delivered the maximum blast ($N$ = 77), there were negative correlations between maximum blast latency and blast intensity across levels of provocation ($r$ = -.43 on no provocation, $r$ = -.59 on low provocation, and $r$ = -.39 on high provocation; all significant at $p < .0001$). Specifically, higher blast intensities were delivered by those who had delivered the maximum blast to the opponent

earlier in the TCRT. The correlation persisted when analysed separately for males and females, except on high provocation. On high provocation, the correlation between maximum blast latency and blast intensity became non-significant for females ($r$ = -.30, $p$ = .08).

### 4.4.6 Moderation of mindfulness induction on the link between depletion and indirect aggression

The moderating effect of mindfulness induction on the link between depletion and each indirect aggression item was analysed separately, also using a bootstrapping method (Table 4.6). As in Study 2, to survive Bonferroni corrections ($p$ < .01), we used 99% bias-corrected confidence intervals. Mindfulness induction did not moderate the relationship between depletion and indirect aggression (Hypothesis 2c). Additionally, there were no significant main effects of depletion or mindfulness induction on indirect aggression (Hypothesis 1c).

Table 4.6.
*Moderation models with bootstrapping method, using depletion as predictor, mindfulness as moderator, rating of opponent as outcome*

| Model tested | Aggressive | | Skilful | | Competitive | | Fair | | Play again | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* | *B* | *SE* | *B* | *SE* | *B* | *SE* |
| Depletion ($c_1$) | .20 | .24 | -.09 | .24 | .09 | .24 | .40 | .32 | -.02 | .30 |
| Mindfulness induction ($c_2$) | -.06 | .24 | .06 | .23 | .16 | .24 | -.04 | .32 | .24 | .30 |
| Depletion x mindfulness ($c_3$) | .03 | .48 | -.25 | .47 | -.04 | .47 | -.11 | .63 | -.72 | .60 |
| $R^2$ on interaction | 0% | | 26% | | 0% | | .30% | | 1.31% | |

*Note. B* = unstandardised regression coefficient; *SE* = standard error; $R^2$ = variance increase
$^{*}p$ < .05; $^{**}p$ < .01; $^{***}p$ < .001

As suggested in section 4.4.3, no sex differences were found in any of the indirect aggression ratings ($p$ = .06 to 50), so we did not break down moderation models by sex (see Table 4.7 for sex differences in ratings of indirect aggression).

Table 4.7.
*Sex differences based on rating of opponent*

| Indirect aggression | Males ($n$ = 52) | Females ($n$ = 58) | $t$ |
|---|---|---|---|
| | $M$ ($SD$) | $M$ ($SD$) | |
| Aggressive | 3.94 (1.31) | 4.24 (1.16) | $t(108) = -1.28$, $p = .21$ |
| Skilful | 4.75 (1.37) | 5.03 (1.01) | $t(108) = -1.22$, $p = .23$ |
| Competitive | 4.87 (1.31) | 5.31 (1.10) | $t(108) = -1.94$, $p = .06$ |
| Fair | 4.40 (1.87) | 4.71 (1.41) | $t(94.46) = -.95$, $p = .35$ |
| Play again | 5.46 (1.70) | 5.26 (1.46) | $t(108) = .67$, $p = .50$ |

$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

The moderation analyses for ratings of the opponent skill, fairness, and participants willingness to play against the same opponent were repeated by including the hypothesised covariates based on the prior significant zero-order correlations between covariates and rating indirect aggression (Table 4.8; see again Table 4.2, in which no personality variables were significantly associated with ratings of opponent aggressiveness and competitiveness). Nevertheless, there was no effect of experimental conditions on ratings for these items (Hypothesis 3). Those who were higher in NA following depletion task rated the opponent as being less skilful, and a less willingness to take part in a task with the same opponent again. The positive impact of curiosity on participants' willingness to take part in a task with the same opponent again nearly survived Bonferroni correction ($p < .011$).

Table 4.8.
*Moderation models with bootstrapping method, using depletion as predictor, mindfulness as moderator, rating of opponent as outcome, controlling for covariates*

| Model tested | Skilful | | Fair | | Play again | |
|---|---|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* | *B* | *SE* |
| Depletion ($c_1$) | -.01 | .23 | .52 | .31 | .13 | .28 |
| Mindfulness induction ($c_2$) | .01 | .23 | -.13 | .31 | .06 | .28 |
| Depletion x mindfulness ($c_3$) | -.40 | .47 | -.21 | .62 | -.40 | .58 |
| $R^2$ on interaction | .65% | | .09% | | .39% | |
| Covariates: | | | | | | |
| MAAS | - | - | -.23 | .27 | - | - |
| SCS | - | - | -.41 | .34 | - | - |
| AQ Total | .42 | .31 | - | - | - | - |
| AQ Verbal aggression | .10 | .21 | - | - | - | - |
| STAR Provocations | - | - | .35 | .32 | - | - |
| STAR Frustrations | - | - | .03 | .32 | - | - |

| Model tested | Skilful | | Fair | | Play again | |
|---|---|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* | *B* | *SE* |
| TMS Curiosity | - | - | - | - | .45* | .17 |
| PANAS NA1 | -1.09** | .37 | - | - | -1.70** | .45 |
| Self-harm | - | - | .62 | .52 | - | - |

*Note. B* = unstandardised regression coefficient; *SE* = standard error; $R^2$ = variance increase
*$p < .05$; **$p < .01$; ***$p < .001$

### 4.4.7 Correlation between blast intensity and indirect aggression

A significant correlation between blast intensity and indirect aggression was found in rating of the opponent's fairness, such that participants evaluate the opponent that they had blasted with more intense blasts as being more fair (Table 4.9).

Table 4.9.

*Bivariate correlations between blast intensity and rating of opponent*

| Indirect aggression | No provocation | Low provocation | High provocation |
|---|---|---|---|
| Aggressive | -.05 | -.05 | .00 |
| Skilful | .01 | .06 | .14 |
| Competitive | -.09 | -.15 | -.12 |
| Fair | .08 | .24* | .27** |
| Play again | -.02 | .05 | .10 |

*$p < .05$; **$p < .01$; ***$p < .001$

Table 4.10.

*Correlations between blast intensity and rating of opponent based on sex*

| Indirect aggression | Males (n = 52) | | | Females (n = 58) | | |
|---|---|---|---|---|---|---|
| | No provocation | Low provocation | High provocation | No provocation | Low provocation | High provocation |
| Aggressive | -.02 | -.04 | -.01 | -.04 | -.02 | .04 |
| Skilful | .12 | .19 | .26 | -.12 | -.06 | .02 |
| Competitive | .11 | .01 | -.01 | -.31* | -.30* | -.22 |
| Fair | .19 | .35* | .36** | -.06 | .12 | .16 |
| Play again | -.07 | -.03 | .08 | .02 | .12 | .10 |

*$p < .05$; **$p < .01$; ***$p < .001$

When we broke down the correlations by sex (Table 4.10), we found that the correlation between blast intensity and rating of opponents' fairness was more pronounced in males than in females. Females evaluated opponents that they had blasted with more intense blasts as being less competitive.

### 4.4.8 Moderation of mindfulness induction on the link between depletion and self-control performance

Table 4.11.
*Overall change in handgrip performance*

| | Depletion | | No depletion | |
|---|---|---|---|---|
| | Change 1 | Change 2 | Change 1 | Change 2 |
| Mindfulness induction | -7.04 | -6.25 | -2.33 | -2.56 |
| No mindfulness | -17.93 | -12.41 | -9.86 | -12.61 |

*Note*. Higher positive scores indicate better self-control on all measures. Values represent the changes in mean time that participants squeezed the handgrip pre-TCRT task (Change 1) and post-TCRT task (Change 2).

Table 4.11 shows the changes in self-control performance as measured by mean differences between handgrip duration at baseline and pre-TCRT task (Change 1) and post-TCRT task (Change 2). Change 1 and Change 2 were positively correlated ($r$ = .72, $p$ < .0001).

Table 4.12.
*Moderation models with bootstrapping method, using depletion as predictor, mindfulness as moderator, changes in handgrip performance as outcome, controlling for covariates*

| Model tested | Change 1 | | Change 2 | |
|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* |
| Depletion ($c_1$) | -5.14 | 3.33 | -3.20 | 3.22 |
| Mindfulness induction ($c_2$) | 9.23** | 3.27 | 8.26** | 3.17 |
| Depletion x mindfulness ($c_3$) | .69 | 6.56 | -4.68 | 6.34 |
| $R^2$ on interaction | .01% | | .44% | |
| Covariates: | | | | |
| Sex | 13.98*** | 3.28 | 6.22 | 3.33 |
| SCS | -5.82 | 3.03 | - | - |
| AQ Physical Aggression | - | - | -5.23* | 2.05 |

*Note. B* = unstandardised regression coefficient; *SE* = standard error; $R^2$ = variance increase
Change 1 = mean time differences between handgrip duration at baseline and pre-TCRT task; Change 2 = mean time differences between handgrip duration at baseline and post-TCRT task
*$p$ < .05; **$p$ < .01; ***$p$ < .001

The significantly correlated personality factors (i.e., sex and trait self-control at Change 1; sex and trait physical aggression at Change 2; see again Table 4.2) were entered into the moderation models (Table 4.2). The effect of depletion at Change 1 (Hypothesis 4a) and Change 2 (Hypothesis 4b) on handgrip performance was not moderated by mindfulness induction. Mindfulness induction alone predicted handgrip performance at both time points after controlling for these covariates. In addition, a better handgrip performance at Change 1 was shown by females. A better handgrip performance at Change 2 was shown by those with lower levels of physical aggression. Sex differences in handgrip stamina are presented in Figure 4.5.

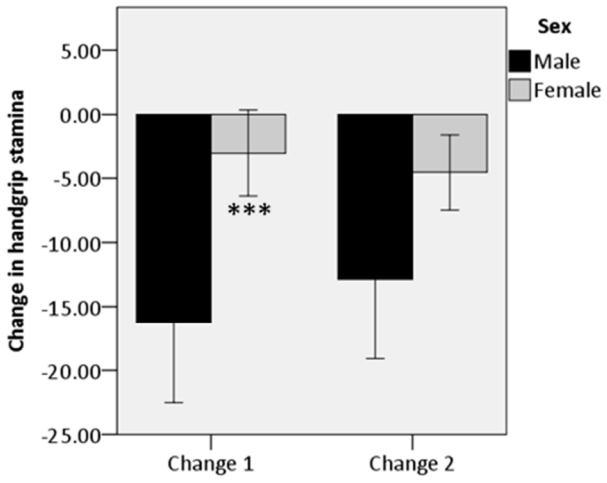


Figure 4.5. Sex differences in handgrip stamina. Higher positive scores indicate better self-control in Change 1 (pre-TCRT task) and Change 2 (post-TCRT task). Error bars represent standard error of mean, asterisk indicates significant ($p < .001$) sex differences in handgrip stamina.

## 4.5 DISCUSSION

### 4.5.1 Effect of mindfulness induction on aggressive behaviour following depletion

The current study employed manipulations of ego-depletion and mindfulness, using 110 (58 females) native British students. As expected, the first main analysis revealed that following no provocation and low provocation trials, depleted

participants who received mindfulness induction delivered lower levels of blast intensity to the opponent compared to depleted ones with no mindfulness induction. This finding supports our proposal that the negative effect of depletion on people's tendency to behave aggressively might be counteracted by mindfulness interventions. Additionally, under high provocation trials, the moderating effect of mindfulness on the depletion and direct aggression link diminished, and so did the main effect of depletion on direct aggression. This latter finding is in line with past research showing that a very intense level of provocation is commonly sufficient to decrease the effect of a number of variables, such as sex differences (Bettencourt & Miller, 1996), and initially non-aggressive opponent's behaviour (Lawrence & Hutchinson, 2013a, 2013b) on direct aggression (i.e., ceiling effect). Our next experiment will examine if a similar effect also occurs in a non-Western sample.

The second main analysis revealed a reverse effect of mindfulness induction on maximum blast latency following depletion in females. Specifically, the likelihood of delivering the maximum blast earlier increased for depleted females with mindfulness induction as opposed to depleted females with no mindfulness induction—although this tendency was not generally accompanied by higher blast intensity. The decrease in maximum blast latency may, be explained in two ways. Depleted females who received mindfulness induction may have not only fully attended to the experience of being provoked, but also responded in a reactive way that was inconsistent with mindfulness. For novice practitioners, the ability to observe internal and external experiences may be associated with nonsignificant and sometimes even positive correlations with psychological symptoms, suggesting inclination to observe in a judgmental way (Baer et al., 2008). Future studies could include a measure of mindfulness on the facets of observing and nonjudging (e.g., Baer et al.'s Five Facet Mindfulness Questionnaire [FFMQ], 2006), to test the possible sex differences on these facets.

Sex differences in maximum blast latency might also be related to the subtle/implicit nature of the latency measure. For instance, previous TCRT work looking at shock intensity and shock duration found that under the influence of alcohol, females delivered only higher levels of shock duration, whereas their counterpart males expressed aggression in both measures (Giancola & Zeichner, 1995). Evers, Fischer, Mosquera, and Manstead (2005) also found that females expressed lesser anger (i.e., delivered less hot sauce to a partner) than males when they expected negative social consequences, but no sex differences were found in the nonsocial condition (see also Eagly & Wood, 2009). Delivering earlier maximum blast might be a way for females of being aggressive, but less obviously so, if they feel less judged.

The prior literature suggests that the sex differences in aggression usually narrows when indirect aggression is measured. Accordingly, significant sex differences were found in terms of blast intensity on low provocation, and approaching significant on blast intensity on no provocation and on maximum blast latency. No sex differences were found on ratings of indirect aggression. Moreover, ratings of indirect aggression for both males and females were not predicted by any of the experimental conditions, but were related to negative affect following depletion. Those who were higher in negative affect rated the opponent as being less skilful and expressed less willingness to take part in a task with the same opponent again. This is quite a common finding, since aggressive behaviour is typically triggered by negative affect (e.g., anger) produced by unpleasant experiences (Anderson & Bushman, 2002; Berkowitz, 1989, 1990, 1993).

In addition, both traits of mindfulness and self-control were insubstantially associated to aggressive behaviour, although they were negatively correlated with individual propensity to aggress (i.e., trait aggression, sensitivity to provocations [SP] and frustrations [SF]; similar to the finding in Study 1 and 2). Self-harm was even not correlated to any of self-reported measures or to aggressive behaviour. Thus the role of personality variables might even be less salient when aggressive behaviour were measured following depletion. However, individual differences in SP did predict

higher levels of blast intensity under low provocation (similar to Lawrence & Hutchinson, 2013b). The significant link between depletion and blast intensity under low provocation was also activated after the inclusion of SP. This finding (also in Study 2) generally supports Lawrence's (2006) notion that SP may generate specific predictions about *who* is likely to behave aggressively to provoking triggers.

### 4.5.2 Effect of mindfulness induction on self-control performance following depletion

There was a main effect of mindfulness on self-control performance (i.e., handgrip stamina/changes in handgrip duration relative to baseline) when self-control performance was measured before the TCRT task. Specifically, participants who performed mindfulness exercise outperformed those who did not perform this exercise. This effect, however, was independent of the effect of depletion condition. In fact, no usual effect of depletion condition was found on self-control performance. Females also outperformed males.

The main effect of mindfulness induction persisted when self-control performance was measured again after the TCRT task. At this point, there was still no moderating effect of mindfulness induction on the link between ego-depletion and self-control performance. Here again, depletion condition did not influence participant's ability to perform self-control task. Altogether, it seems in the current sample, the effect of mindfulness induction on self-control performance was less predictable by the mechanism of self-control.

### 4.5.3 Strengths and limitations of the current study

Recently, Friese et al. (2012) have demonstrated the benefit of mindfulness induction on self-control ego-depletion outside the area of aggression, but did not explore the effect for non-depleted individuals. The current study extended their

work via a fully crossed design, establishing that in the absence of depletion, the effect of mindfulness induction on aggressive behaviour and self-control performance would be less salient. As in Study 2, three indicators of aggressive behaviour (i.e., blast intensity, maximum blast latency, anonymous reputation damage of opponent) were used in the current study.

The 15-min mindfulness breathing exercise used in the current study was successful in increasing mindfulness state of decentering, but not state of curiosity. According to Lau et al. (2006), curiosity is typically associated with mindfulness meditation experience, in which those with more than 1 year of experience may likely score significantly higher on TMS curiosity than those with less than 1 year of experiences. Therefore, the non-significant changes in curiosity might be related to the current participants' lack of familiarly with mindfulness procedures (only 1 participant reported practising mindfulness on monthly basis). On the other hand, decentering is close to Shapiro et al.'s (2006) conceptualisation of *reperceiving* (i.e., a shift in perception that the experiences perceived by the individuals are separate from the individuals themselves). As discussed in Chapter 1, reperceiving enables individuals to become more tolerant to unpleasant experiences related to depletion and aggression-related emotions.

As in Study 2, an important limitation of the current study is that we failed to recruit the optimum number of 128 participants (as calculated by G*Power 3, 2013), albeit our 110 final sample was sufficient with reference to the previous similar study (Friese et al., 2012). Moreover, unlike in Study 2, control participants were not given relaxation procedure, but were asked to listen to a neutral educational information and to complete a word search puzzle (e.g., Erisman & Roemer, 2010). Similar to the control condition for non-mindfulness induction participants in Friese et al.'s (2012) ego-depletion study, these types of task still require participants to pay attention and concentrate, but without inducing additional depleting effect.

### 4.5.4 Conclusions and next step

Findings from the current study suggested that when people's self-control resource has been depleted, mindfulness induction may reduce their aggressive behaviour in terms of blast intensity delivered to the opponent under no provocation and low provocation trials. Individual differences in SP also predicted provoked aggression. Further, sex differences emerged on blast intensity, maximum blast latency, and self-control performance, but not on ratings of indirect aggression. The same experimental study using cross-cultural sample, specifically Indonesian university students, will be presented in the following chapter. Mindfulness is derived from Buddhist and Eastern philosophies and practices. Therefore, it is important to examine the effects of mindfulness interventions following depletion on aggression beyond the Western sample. It may be that the effects of mindfulness seen so far in the thesis are the result of the novelty or salience of an Eastern practice being used in a Western environment and culture. The next chapter asks: does mindfulness on aggression replicate in a non-Western culture. In this way it is also possible to examine whether the insignificant effect of experimental conditions on indirect aggression, as well as the relatively trivial role of personality variables on aggressive behaviour would differ across cultures.

# CHAPTER FIVE

# Study 4: Effect of mindfulness induction on aggressive behaviour following depletion (Indonesian sample)

## 5.1 INTRODUCTION

In the previous study using British sample (Chapter 4), depleted participants who received mindfulness induction displayed less direct aggression (as measured by levels of blast intensity under no provocation and low provocation in the adapted Taylor Competitive Reaction Time [TCRT]: Taylor, 1967, task) as opposed to depleted participants who had not received mindfulness induction. The moderating effect of mindfulness on indirect aggression and self-control performance following depletion was less observable, and was even reversed on the maximum blast latency for British females. The purpose of the present study is to (i) replicate the findings in Chapter 4, and (ii) examine if the mindful effect on depleted participants holds in a sample taken from an Eastern tradition and culture.

### 5.1.1 Mindfulness and Indonesian culture

Mindfulness practices originate in the Eastern contemplative traditions, Buddhism in particular. However, even cross-cultural validation of mindfulness interventions derived from Western operationalisation is currently lacking (Christopher et al., 2009). As a result, this current study replicates the previous study examining the impact of ego depletion and mindfulness intervention on aggressive and self-control behaviour in Indonesian groups.

The application of mindfulness in Indonesia may be reflected in the Javanese's (the largest ethnic groups in Indonesia) endorsement of the "eling" value (Koentjaraningrat, 1989), which means continuously being aware of one's own position in life. Javanese children are conventionally educated to develop a perception of having "enough" (as opposed to wanting more), so that they can

always be aware of all the difficulties and failures they may face in life rather than be driven by the pursuit of goals (Koentjaraningrat, 1989). As noted by Brown et al. (2007a), while mindfulness is not antithetical to the quest of self-controlled goals, the mindful goals are more selective in accord with one's intrinsic values.

### 5.1.2 Indonesian culture and aggression

In the aggression literatures, one pertinent variable that influences cultural differences in their expression and tolerance of conflict, aggression, and anger is individualism vs. collectivism values (Hofstede, 1980; Triandis, 1995). Individualism emphasises the independence from groups and a greater sense of obligation to the individual, whereas collectivism imposes the interdependence of individuals and a greater sense of obligation to the group. As a result, aggression has been conceptualised as a means to win competitions and to achieve self-reliance within the individualistic, but as a disruptive act within the collectivistic cultures (Li et al., 2010).

Hofstede and colleagues (Hofstede, 2010; Hofstede, Hofstede, & Minkov, 2010) have developed a map of individualism, based on replications and extensions of a previous study using IBM employees from 76 countries and study using World Value Survey from representative samples of national populations from 93 countries, where high scores indicate more individualistic cultures/countries and lower scores more collective cultures/countries. This map yields a score of 14 for Indonesia vs. 89 for United Kingdom. The Indonesian Javanese culture strongly prohibits rude conduct, shouting, or open conflict since it is presumed as a sign of lack of self-control and inner strength; and conversely highly values the ability to speak unpleasant subjects in an indirect manner to preserve the impression of harmonised social relationships (Koentjaraningrat, 1985; Magnis-Suseno, 1997). These features are also evident in the Sundanese population (see French, Jansen & Pidada, 2002), the second largest ethnic group in Indonesia. Theoretically, this may reduce the Indonesians' display of direct aggression, particularly physical aggression, compared with societies with stronger individualistic values such as the UK. Past

cross-cultural review (Bergeron & Schneider, 2005) has revealed that peer-directed aggression was positively related to Hofstede's individualism dimension.

As a consequence, however, it is plausible that Indonesian people also have lower tolerance to *indirect* aggression. Forbes et al.'s (2009) study comparing college students in the US (individualist), Poland (mid scoring), and China (collectivist) found that for both direct and indirect aggression, increases in individualism were associated with increases in aggression. Relational or indirect aggression may be unacceptable since it also threatens interpersonal relationships and group harmony (Li et al., 2010). At the same time, the opposite prediction is possible. The need to display harmony may not correspond to the actual individual's emotional states, and could be articulated in the adoption of more indirect methods of retaliation for the collectivist (French et al., 2002). As relational or indirect aggression is more covert, the expression of relational aggression is less seen and therefore not so open to negative evaluations from others.

### 5.1.3 Indonesian culture and self-control

The attributes associated with individualism and collectivism may have straightforward implications for self-control. As discussed in Chapter 1 (section 1.2.3.1), self-control strength is only one of the four major components of self-control (for a full review, see Baumeister, Schmeichel, et al., 2007 and Baumeister & Vohs, 2007). The other three are standard, monitoring, and motivation. Each of these components is necessary for effective self-control, and can compensate for each other to some extent. Thus theoretically, depleted individuals should still be able to exert control provided they have sufficient motivation to conform either to societal expectations or to their own personal values.

Seeley and Gardner (2003) suggested that because individuals high in social orientation (e.g., collectivist cultural background and interdependent beliefs) would be more motivated to engage in self-control in daily social interaction, they may develop greater ability for self-control and become less prone to ego-depletion.

Accordingly, they demonstrated that a thought suppression task reduced handgrip performance amongst native-born US students (i.e., individualistic cultural background) but had no effect on handgrip performance amongst foreign-born Asian students (i.e., collectivism cultural background). A more recent study also showed that social value orientation moderates the impact of depletion (i.e., suppressing emotion while watching a comedy video) on concern with others' well-being in terms of points allocated to others in an interdependent decision-making task (Balliet & Joireman, 2010). These findings suggest that the presence of collectivism value in the Indonesian people may increase their ability to exert control and their resistance to depletion.

It should be noted, however, that self-control in terms of regulating one's behaviours to meet their personal goals and professional achievement is pervasive in Western cultures (Brown et al., 2007a). Thus it is also plausible for the Indonesians to be less familiar to the conceptualisation of self-control derived from Western cultures.

### 5.1.4 Role of mindfulness induction in counteracting the effect of depletion on aggressive behaviour for Indonesian culture

Altogether, a greater familiarity with mindfulness in daily life, lower tolerance to aggression display, and higher resistance to depletion may strengthen the effect of mindfulness induction for the Indonesian. Hence, the moderating role of mindfulness found in Chapter 5 (under conditions of ego-depletion) should also be also seen in the Indonesian sample, in terms of direct aggression (following low provocation in particular) and self-control performance (handgrip stamina). Because the sample in Indonesia is accustomed to mindful ways of thinking, however, it is also plausible that no additional impact of the mindful intervention would be seen.

Additionally, the application of the Taylor paradigm (TCRT task) may be less useful in the Indonesian sample, as the sample has strict sanctions against the use of violence or aggression. To our knowledge, the Taylor paradigm has not been used in Indonesian samples to date, and so this is the first study to examine the

effectiveness of the paradigm here. It is expected that the level of blast intensity should increase with additional provocation in order to demonstrate some validity for the paradigm. Also, as males and females typically differ in aggressive behaviour (e.g., Archer, 2004; Bettencourt & Miller, 1996; Giancola & Parrot, 2008), we should expect to see males delivering higher intensity blasts under conditions of no and low provocation during the TCRT in Indonesia as in the British sample.

## 5.2 HYPOTHESES

Similar to Study 3 (see section 4.2), our general hypothesis is that that ego-depletion will predict higher levels of aggression and impaired self-control performance amongst participants with no mindfulness induction but not amongst participants with mindfulness induction, after accounting for the potential influence of individual differences in mindfulness, self-control, aggression (i.e., trait aggression, sensitivity to provocations [SP] and frustrations [SF]), sex, and self-harm.

## 5.3 METHODS

### 5.3.1 Participants

A total of 124 students from University of Brawijaya, Indonesia entered the current study. Based on sex, participants were randomly assigned to one of the four experimental groups (2: mindfulness [intervention vs. no intervention] x ego-depletion [depletion vs. no depletion]). Five participants were discarded from final analysis due to: expressing spontaneous suspicions expressing spontaneous suspicions regarding the TCRT task (3 participants) and falling asleep during the mindfulness breathing task (2 participants), resulting in 119 participants (60 females). Participants' mean age was 20.40 (*SD* = 1.24), 86.55% belong to Javanese ethnic group, 3.36% Sundanese, and the remainder were of unspecified Indonesian ethnicity. None of the participants reported having current encounter with mindfulness experiences. The current study lasted from February until March 2012.

### 5.3.2 Design

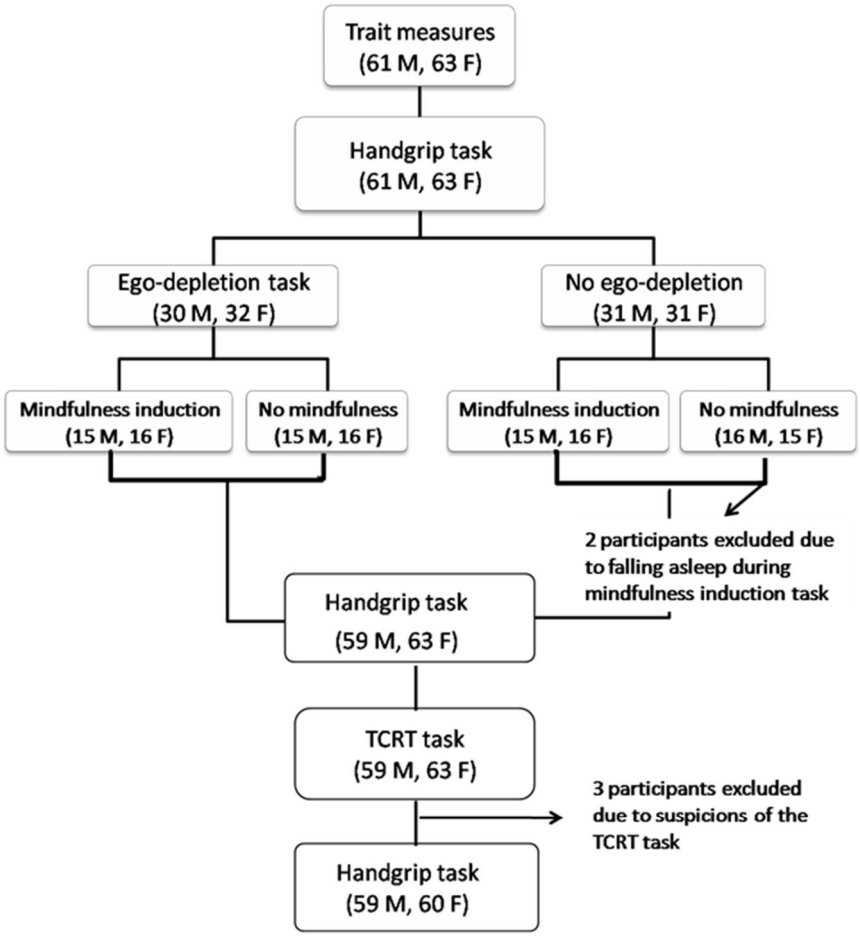


Figure 5.1. Flow of participants through Study 4.
*Note.* M = Males; F = Females

As in the previous study, a 2 (ego-depletion vs. no depletion) x 2 (mindfulness induction vs. no induction) experimental design, along with stratified sampling technique was employed again in this study. Figure 5.1 depicts flow of participants.

### 5.3.3 Trait and state measures

The translation of the trait and state measures in the current study was made by two postgraduate Indonesian students, and was back-translated into English and checked against the original transcript by a commercial translation service (Viesta translator). The adapted measures were then pre-tested to 2 pilot participants. We used the

same set of trait measures from Study 1, 2, and 3 (Appendix 2.1), the state measures from Study 2 and 3 (Appendix 3.1), and the two questions on the efficacy of the depletion manipulation from Study 3 (i.e., task difficulty and the amount of attention control). The description of these measures is provided in section 2.3.3 and 3.3.3.

Following the development of this thesis, cross-validation for some of the aforementioned trait measures is being provided in Asian countries. Specifically, the MAAS (Brown & Ryan, 2003) was recently shown as a sound measure of trait mindfulness in Chinese adolescents (Black, Sussman, Johnson, & Milam, 2012), the AQ (Buss & Perry, 1992) was used amongst female prisoners in Malay (Mazlan & Ahmad, 2012), and the DSHI (Gratz, 2001) was used in university students in Indonesia (Tresno et al., 2012). This supports the idea that Western operationalisations of the concepts of mindfulness and aggression may be related to those concepts in non-Western settings.

### 5.3.4 Experimental manipulations

The current study employed the same ego-depletion task, mindfulness induction, the adapted Taylor Competitive Reaction Time (TCRT: Taylor, 1967) task, and self-control performance/handgrip task from Study 3 (see section 4.3.4).

### 5.3.5 Power calculation

As in Study 3, this study required a total of between 88 (according to the Friese et al.'s study in 2012) to 128 participants (according G*Power 3, 2013, calculation for a medium effect [*d* = .25], given the power of .80 and an alpha level of .05).

### 5.3.6 Procedure

Potential participants from University of Brawijaya, East Java, Indonesia were contacted via posters/leaflets on campus. As in Study 3, participants were told that

the study aimed to investigate the effects of personality traits and experimental treatments on the way people perform in a competitive reaction-time task (Appendix 4.2). They were recruited in exchange for inconvenient allowance (equals to £1) and a chance to win an incentive for the fastest participants' reaction time across the entire study (equals to £10). These amounts are equivalent to the British participants' incentive in terms of real value.

Participants came individually into the Psychology lab at University of Brawijaya, Indonesia. The rest of the procedure followed that outlined in Study 3 (see section 4.3.6, Chapter 4).

### 5.3.7 Data analysis

Statistical analyses (as described in Study 3, section 4.3.6, Chapter 4) were performed using IBM SPSS statistics 20.0 (2011). Importantly, the moderating effect of mindfulness induction on the link between self-control ego depletion and aggressive behaviour (primary hypotheses) and between depletion and self-control performance (secondary hypotheses) were tested with bootstrapping method, using model number 1 in the A. F. Hayes's (2012a) PROCESS macro for simple moderation.

## 5.4 RESULTS

### 5.4.1 Baseline levels

The four experimental groups (i.e., depletion plus mindfulness, depletion no mindfulness, no depletion mindfulness, no depletion no mindfulness) were not significantly different from each other in means of the trait measures ($p$ = .08 to .86), indicating groups equivalency at baseline levels.

None of the participants reported having had experience with mindfulness practice, thus further comparisons based on this factor could not be carried out.

### 5.4.2 Preliminary analysis

Table 5.1 presents the zero-order correlations amongst trait measures and descriptive statistics (*N* = 119). Internal reliabilities ranged from adequate ($\alpha$ = .69) to high ($\alpha$ = .88), except for verbal aggression ($\alpha$ =.50). Deleting any of the verbal aggression items did not increase its reliability ($\alpha$ = .38 to .52). We decided to retain this subscale in the calculation of a total or general trait aggression score since it was significantly related to two out of three other subscales in the AQ as in the majority of previous studies using this scale (i.e., physical aggression and anger). Moreover, excluding this subscale did not alter the reliability for the total aggression ($\alpha$ only increased to .82 from .81).

Importantly, as in Study 1, 2, and 3, trait mindfulness and trait self-control were positively correlated to each other. Self-control was negatively correlated to all of the self-reported aggression except verbal aggression, whereas mindfulness was only negatively correlated to anger and hostility.

Table 5.1.
*Zero order correlations and psychometric properties of measures*

| Measures | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| MAAS (1) | 1.00 | | | | | | | | |
| SCS (2) | .48** | 1.00 | | | | | | | |
| Total AQ (3) | -.28** | -.47*** | 1.00 | | | | | | |
| AQ Physical (4) | -.15 | -.36*** | .72*** | 1.00 | | | | | |
| AQ Verbal (5) | -.04 | -.05 | .55*** | .30** | 1.00 | | | | |
| AQ Anger (6) | -.24** | -.47*** | .83*** | .47*** | .26** | 1.00 | | | |
| AQ Hostility (7) | -.34*** | -.38*** | .62*** | .24** | -.02 | .46*** | 1.00 | | |
| STAR Provocations (8) | -.02 | -.36*** | .52*** | .33*** | .18 | .47*** | .42*** | 1.00 | |
| STAR Frustrations (9) | -.07 | -.39*** | .49*** | .23* | .15 | .51*** | .41*** | .83*** | 1.00 |
| *M* | 3.93 | 3.14 | 2.76 | 2.92 | 2.77 | 2.14 | 3.14 | 2.67 | 3.09 |
| *SD* | .57 | .46 | .45 | .78 | .82 | .61 | . 63 | .76 | .64 |
| $\alpha$Cronbach | .77 | .74 | .81 | .87 | .88 | .69 | .50 | .71 | .72 |

*Note*. MAAS = Mindful Attention Awareness Scale; SCS = Self-Control Scale; AQ = Aggression Questionnaire; STAR = Situational Triggers of Aggressive Responses
*$p$ < .05; **$p$ < .01; ***$p$ < .001

Compared to females (*n* = 60), males (*n* = 59) scored significantly higher on physical aggression ($t$(104.83) = 3.34, $p$ < .001; *M* males = 2.32, *SD* = .67 vs. *M* females = 1.96, *SD* = .48) and lower on sensitivity to frustrations (SF: $t$(117) = -2.51, $p$ < .05; *M* males

= 2.58, *SD* = .78 vs. *M* females = 2.95, *SD* = .83). Compared to non self-harmers (*n* = 97), self-harmers (*n* = 22) scored higher on general trait aggression (*t*(117) = 2.00, *p* < .05; *M* self-harmers = 2.93, *SD* = .47 vs. *M* non self-harmers = 2.72, *SD* = .44), physical aggression (*t*(117) = 2.03, *p* < .05; *M* self-harmers = 2.37, SD = .68 vs. *M* non self-harmers = 2.09, *SD* = .58), and hostility (*t*(117) = 2.07, *p* < .05; *M* self-harmers = 3.34, *SD* = .69 vs. *M* non self-harmers = 3.03, *SD* = .62), as well as on sensitivity to provocations (SP: *t*(117) = 3.22, *p* < .001; *M* self-harmers = 3.38, *SD* = .86 vs. *M* non self-harmers = 2.80, *SD* = .73) and frustrations (SF: *t*(117) = 2.51, *p* < .05; *M* self-harmers = 3.15, *SD* = .91 vs. *M* non self-harmers = 2.67, *SD* = .78). However, none of the associations were significantly altered when we carried out partial correlations controlling for sex (*r* = -.05 to .84) or self-harm status (*r* = .02 to .83).

### 5.4.3 Correlation between personality variables and experimental outcomes

Similar to Study 3, the experimental outcomes in the current study consisted of (i) direct aggression: blast intensity on each provocation level and maximum blast latency, (ii) indirect aggression, and (iii) self-control performance/handgrip stamina in Change 1 (changes in pre-TCRT task handgrip duration relative to baseline) and Change 2 (changes in post-TCRT task handgrip duration relative to baseline). Associations between outcomes and personality variables are shown in Table 5.2.

#### 5.4.3.1 Associations with direct aggression

Positive affect (PA) assessed following depletion condition and following the TCRT task was significantly related to blast intensity under high provocation. Additionally, compared to females, males delivered higher blast intensity under no provocation and low provocation, but not on high provocation (see Table 5.3). No differences were found between self-harmers and non self-harmers on any direct aggression behaviour (*p* = .55 to .84).

None of the personality variables were significantly correlated to maximum blast latency. Maximum blast latency was only associated with sex ($t(82.45) = 2.46$, $p < .01$), such that females ($n = 45$) waited significantly longer than males ($n = 53$) before delivering the maximum blasts ($M$ males = 7.11, $SD$ = 10.08 vs. $M$ females = 12.96, $SD$ = 12.95). No differences were found between self-harmers ($n = 19$) and non self-harmers ($n = 79$; $t(96) = .80$, $p = .43$) on maximum blast latency.

#### 5.4.3.2 Associations with indirect aggression

The rating of the opponent's aggressiveness was negatively related to physical and verbal trait aggression and positively related to PA1 (following depletion task) and PA2 (following the TCRT task). PA at both time points was also positively related to participants' willingness to play against the same opponent again; this rating was also positively related to trait hostility. The rating of opponent's skilfulness was negatively related to physical aggression and SP and positively correlated to NA following depletion. No sex differences were found in any of the ratings ($p$ =.11 to 61). Likewise, no significant differences between self-harmers and non self-harmers in the ratings ($p = .17$ to $.91$)

#### 5.4.3.3 Associations with self-control performance

Self-control performance (i.e., handgrip stamina) at Change 1 was associated with state mindfulness. Additionally, females outperformed males in Change 2 ($t(117) = 2.62$, $p < .01$; $M$ male = -12.80, $SD$ = 17.19 vs. $M$ female = -5.15, $SD$ = 14.61), but not in Change 1 ($t(117) = 1.42$, p = .16; $M$ male = -3.68, $SD$ = 19.23 vs. $M$ female = 1.07, $SD$ = 16.68). No significant differences between self-harmers and non self-harmers in Change 1 ($t(117) = .79$, $p = .43$) and Change 2 ($t(117) = .18$, $p = .86$).

Table 5.2.
*Zero order correlations of personality measures, aggressive behaviour, and self-control performance*

| Measures | Blast intensity based on levels of provocation | | | Max. blast latency | Rating indirect aggression | | | | | Handgrip stamina | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | No | Low | High | | Aggressive | Skilful | Competitive | Fair | Play again | Change 1 | Change 2 |
| MAAS | .15 | .01 | .05 | .03 | .14 | -.01 | -.13 | -.15 | -.09 | .04 | -.05 |
| SCS | .06 | -.08 | .02 | .11 | .07 | -.08 | -.17 | -.08 | -.05 | .10 | -.09 |
| AQ Total | -.03 | .10 | .01 | -.11 | -.17 | -.02 | .01 | .06 | .09 | .10 | .14 |
| AQ Physical Aggression | -.03 | .13 | .04 | -.14 | -.23* | -.20* | -.16 | -.13 | -.16 | .01 | .10 |
| AQ Verbal Aggression | -.02 | .06 | -.03 | -.12 | -.19* | -.11 | -.06 | .10 | -.03 | .07 | -.01 |
| AQ Anger | -.06 | -.01 | -.01 | -.04 | -.11 | .09 | .10 | .04 | .14 | .11 | .12 |
| AQ Hostility | .04 | .09 | .03 | -.04 | .05 | .14 | .12 | .13 | .26** | .05 | .17 |
| STAR Provocation | .12 | .17 | .01 | -.16 | -.07 | -.19* | .00 | .16 | .09 | .12 | .15 |
| STAR Frustration | .06 | .03 | -.03 | -.03 | -.11 | -.13 | -.01 | .09 | .01 | .16 | .23* |
| TMS Curiosity | -.07 | -.04 | -.06 | .12 | -.11 | .02 | -.14 | .13 | .17 | .21* | .10 |
| TMS Decentering | -.03 | -.01 | -.10 | -.02 | .04 | .03 | .02 | -.03 | .09 | .20* | .06 |
| PANAS PA1 | .17 | .16 | .28* | -.13 | .22* | -.02 | -.09 | -.02 | .25** | .17 | -.06 |
| PANAS NA1 | -.02 | .03 | -.01 | .03 | .07 | .21* | .18 | .02 | .06 | -.10 | .00 |
| PANAS PA2 | .09 | .08 | .20* | -.04 | .20* | .03 | -.10 | .11 | .38** | .13 | -.05 |
| PANAS NA2 | .04 | -.03 | .00 | -.10 | .00 | .12 | .13 | -.02 | .09 | .11 | -.09 |

*Note.* MAAS = Mindful Attention Awareness Scale; SCS = Self-Control Scale; AQ = Aggression Questionnaire; STAR = Situational Triggers of Aggressive Responses; TMS = Toronto Mindfulness Scale, PANAS 1 = Positive Affect Negative Affect following depletion; PANAS 2 = Positive Affect Negative Affect post-TCRT task
All correlations were based on $N$ = 119, except for maximum blast latency. The correlations for maximum blast latency was made only for participants who delivered a maximum blast ($N$ = 98).
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

### 5.4.4 Manipulation checks

The depletion (attention control) manipulation was effective. Participants in the attention control condition ($n$ = 59) rated the task as more difficult than those in the no control condition ($n$ = 60; $t(117) = 4.35$, $p < .0001$; $M$ attention control = 3.68, $SD$ = 1.73 vs. $M$ no control = 2.37, $SD$ = 1.56) and having controlled their attention to a greater extent than no control participants ($t(117) = 4.65$, $p < .0001$; $M$ attention control = 3.78, $SD$ = 1.77 vs. $M$ no control = 2.33, $SD$ = 1.62). The two questions measuring depletion condition were positively correlated ($r = .46$, $p < .0001$).

The mindfulness breathing task succeeded in increasing participants decentering ($t(117) = 2.36$, $p < .05$; $M$ mindfulness induction = 2.38, $SD$ = .47 vs. $M$ no induction = 2.18, $SD$ =. 47), but not their curiosity ($t(117) = 1.65$, $p = .10$; $M$ mindfulness induction = 2.77, $SD$ = .54 vs. $M$ no induction = 2.61, $SD$ = . 53). Internal consistency in both scales were adequate for curiosity ($\alpha = .76$) and fair for decentering ($\alpha = .62$). Both scales were positively correlated ($r = .61$, $p < .0001$).

Mood after depletion did not differ between depleted and non-depleted participants (PA1: $t(101.65) = -.75$, $p = .45$; NA1: $t(117) = .20$, $p = .85$). Both scales showed good internal consistency ($\alpha = .79$ and .81 for PA1 and NA1, respectively), but were not correlated ($r = -.02$, $p = .80$). Similarly, mood following the TCRT did not differ between depleted and non-depleted participants (PA2: $F(3,115) = 1.57$, $p = .20$; NA2: $F(3,115) = 1.05$, $p = .37$). Both scales showed good internal consistency ($\alpha = .84$ for both PA2 and NA2) and were positively correlated ($r = .28$, $p < .005$). Results from both mood measures indicated that the experimental outcomes would not be affected by fluctuations in participants' mood following the manipulations.

### 5.4.5 Moderation of mindfulness induction on the link between depletion and direct aggression

#### 5.4.5.1 Levels of blast intensity

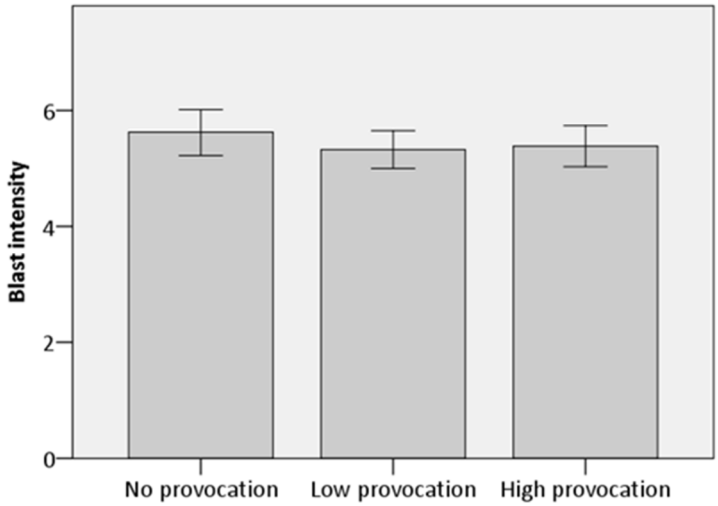


Figure 5.2. Effect of level of provocations on blast intensity.
Error bars indicate standard error of mean. Scale goes up to 8 as a maximum.

A one-way repeated-measure ANOVA was performed to test differences in blast intensity under no provocation, low provocation, and high provocation trials (Figure 5.2). Unusually, blast intensity was not affected by level of provocation ($F$(1.56, 183.69) = 1.88, $p$ = .17). Participants did not deliver higher blast intensity under low provocation ($M$ = 5.32, $SD$ = 1.78) compared to under no provocation ($M$ = 5.61, $SD$ = 2.20; $p$ = .06), or under high provocation ($M$ = 5.37, $SD$ = 1.94) compared to under low provocation ($p$ =.63).

A comparable pattern of results was shown when we included sex (a 2 [sex] by 3 [provocation level] mixed analysis ANOVA), in which blast intensity was neither affected by level of provocations, ($F$(1.55, 181.64) = 1.91, $p$ = .16) nor by interaction between sex and level of provocations ($F$(1.55, 135.95) = 2.04, $p$ = .14). It should be noted, however, that the typical sex differences in the TCRT task (see Giancola & Parrott, 2008) occurred in this sample, in that males delivered higher intensity blasts under conditions of no and low provocation but not under high provocation compared to females (Table 5.3).

Table 5.3.
*Sex differences on blast intensity on each provocation level*

| Level of provocations | Males ($n$ = 59) | Females ($n$ = 60) | $t$ |
|---|---|---|---|
| | $M$ ($SD$) | $M$ ($SD$) | |
| No provocation | 6.03 (2.05) | 5.20 (2.30) | $t(117) = 2.09$* |
| Low provocation | 5.70 (1.83) | 4.94 (1.67) | $t(117) = 2.36$* |
| High provocation | 5.49 (2.17) | 5.26 (1.68) | $t(109.28) = .65$, $p = .52$ |

$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

As in Study 3, the moderation model of mindfulness on the link between depletion and blast intensity (Table 5.4) was tested using a bootstrapping method (model "number 1" in A. F. Hayes's (2012a) PROCESS macro), with 95% bias-corrected confidence intervals (based on 5,000 bootstrap resamples, $N$ = 119). All predictors were mean-centered. Mindfulness induction significantly moderated the link between depletion and blast intensity under low provocation only (Hypothesis 2a). Specifically, following low provocation, depleted participants with mindfulness induction delivered lower levels of blast intensity compared to depleted ones without induction, whereas non-depleted participants with mindfulness induction delivered comparable blast intensity with non-depleted ones without induction (See Figure 5.3). Additionally, there was a significant main effect of depletion on blast intensity under low provocation (Hypothesis 1a).

Table 5.4.
*Moderation models with bootstrapping method, using depletion as predictor, mindfulness as moderator, blast intensity as outcome*

| Model tested | No provocation | | Low provocation | | High provocation | |
|---|---|---|---|---|---|---|
| | $B$ | $SE$ | $B$ | $SE$ | $B$ | $SE$ |
| Depletion ($c_1$) | .30 | .40 | .63 | .32$^{*}$ | .52 | .35 |
| Mindfulness induction ($c_2$) | -.50 | .40 | -.35 | .32 | -.33 | .35 |
| Depletion x mindfulness ($c_3$) | -1.28 | .80 | -1.28 | .63$^{*}$ | -1.23 | .70 |
| $R^2$ on interaction | 2.11% | | 3.25%$^{*}$ | | 2.52% | |
| Conditional effect of depletion without mindfulness | | | 1.29$^{**}$ | .45$^{**}$ | | |
| Conditional effect of depletion with mindfulness | | | -.001 | .45 | | |

*Note.* $B$ = unstandardised regression coefficient; $SE$ = standard error; $R^2$ = variance increase
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

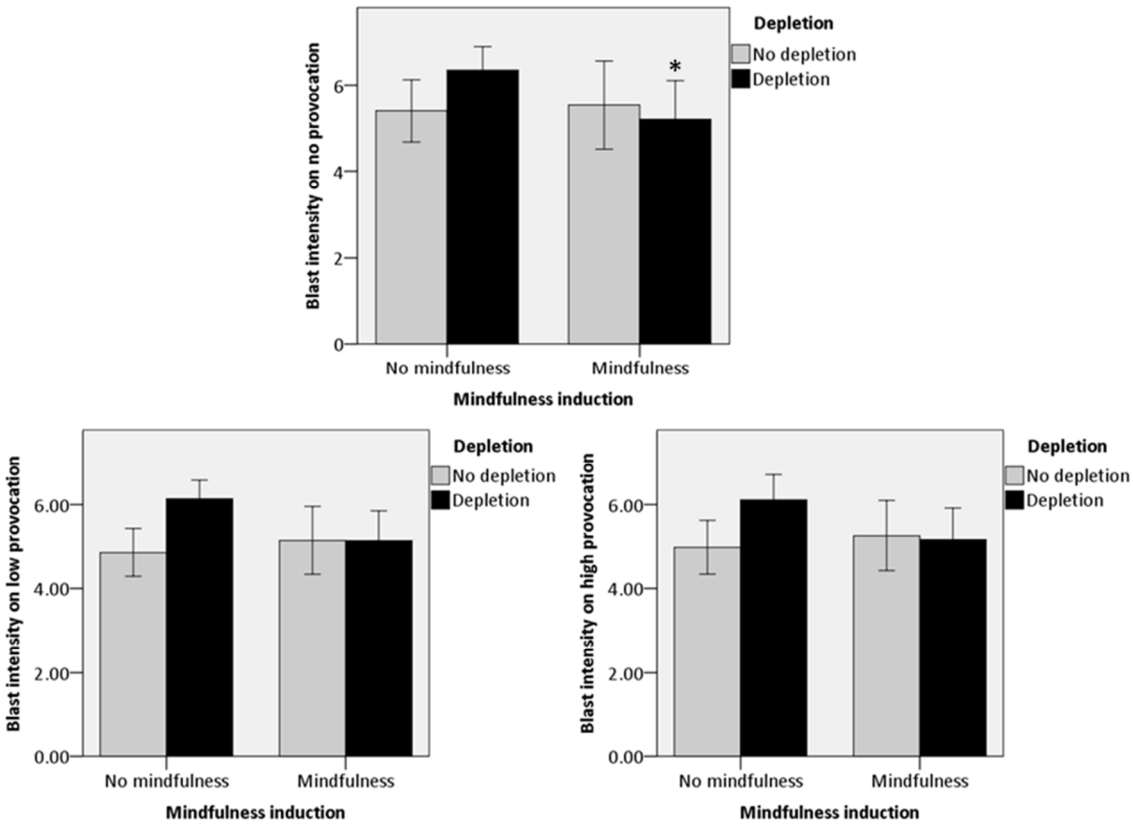


Figure 5.3. Mindfulness × depletion effect on blast intensity across provocation levels. Error bars indicate standard error of mean, asterisk indicates significant ($p < .05$) decrease in blast intensity. Scale goes up to 8 as a maximum.

The moderation analysis was then repeated by controlling the associated personality variables (i.e., sex, post-depletion and post-TCRT task positive affect; see again Table 5.2). Controlling for the hypothesised covariates yielded a similar pattern of results, except under high provocation (Table 5.5). Specifically, by controlling positive affect at both time points, the previously non-significant interaction between mindfulness induction and depletion on blast intensity became significant, ($c_3$: $B$ = -1.41, $SE$ = .69, $p < .05$) when provocation from the opponent was high. The total variance due the interaction increased from 2.52% to 3.29% ($F(1, 113) = 4.24$, $p < .05$), in which depleted participants with mindfulness induction delivered lower levels of blast intensity compared to depleted ones without induction. However, there were still no significant main effects of depletion ($c_1$: $B$ increased from = .52 to .60, $p = .08$) or mindfulness induction ($c_2$: $B$ increased from = -.33 to -.45, $p = .19$) on blast intensity under high provocations.

Taken together, Hypothesis 3 was partly supported such that mindfulness induction moderated the effect of depletion on blast intensity when participants were being provoked, but not without provocation, after controlling for covariates. Being male increased the likelihood of higher levels of blast intensity under no provocation and low provocation, but the effect of sex diminished on high provocation.

Table 5.5.
*Moderation models with bootstrapping method, using depletion as predictor, mindfulness as moderator, blast intensities as outcome, controlling for covariates*

| Model tested | No provocation | | Low provocation | | High provocation | |
|---|---|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* | *B* | *SE* |
| Depletion ($c_1$) | .31 | .40 | .64* | .31 | .60 | .34 |
| Mindfulness induction ($c_2$) | -.51 | .40 | -.36 | .31 | -.45 | .34 |
| Depletion x mindfulness ($c_3$) | -1.29 | .79 | -1.29* | .62 | -1.41* | .69 |
| $R^2$ on interaction | 2.16% | | 3.31%* | | 3.29%* | |
| Conditional effect of depletion without mindfulness | | | 1.29** | .44 | 1.31** | .49 |
| Conditional effect of depletion with mindfulness | | | -.001 | .44 | -.10 | .48 |
| Covariates: | | | | | | |
| Sex | -.85* | .39 | -.77* | .31 | - | - |
| PANAS PA1 | - | - | - | - | .55 | .41 |
| PANAS PA2 | - | - | - | - | .36 | .39 |

*Note. B* = unstandardised regression coefficient; *SE* = standard error; $R^2$ = variance increase
PANAS PA1 = Post-depletion positive affect; PANAS PA2 = Post-TCRT task positive affect
*$p < .05$; **$p < .01$; ***$p < .001$

### 5.4.5.2 Maximum blast latency

Censored survival analyses using Cox regressions were carried out to assess the extent to which individuals were more likely to administer the maximum blasts as a function of the experimental conditions. During the TCRT, 17.6% (*N* = 21) participants did not deliver any maximum blasts to the opponents. Our proposed model (mindfulness induction x depletion on maximum blast latency) was not significant ($\Delta\chi^2 = 5.09$, $p = .17$). Supporting Hypothesis 2b, the likelihood of delivering the maximum blast to opponent was predicted by the interaction between mindfulness and depletion (Wald = 4.70, $p < .03$, CI 95% [.18, .92], exp(*B*) = .40), but not by depletion (Hypothesis 1b: Wald = 3.00, $p = .08$, CI [.94, 2.92], exp(*B*) = 1.65) or mindfulness (Wald = 1.40, p = .24, CI [.80, 2.39], exp(*B*) = 1.39) independently.

Depleted participants with who received mindfulness induction were less likely to deliver maximum blast earlier.

We repeated the censored survival analyses to assess the extent to which depletion and mindfulness induction influenced maximum blasts latency controlling for the hypothesised covariates (i.e., sex). The final model was marginally significant ($\Delta\chi^2$ = 9.31, $p$ < .054), supporting Hypothesis 3. The point at which participants delivered the maximum blast was influenced by the interaction of mindfulness and depletion (Wald = 4.03, $p$ < .05, CI [.19, .98], exp($B$) = .43), and sex (Wald = 4.23, $p$ < .05, CI [1.02 to 2.37], exp($B$) = 1.56). Specifically, depleted participants with mindfulness induction, and females were less likely to deliver maximum blast earlier to the opponent. There was no main effect of mindfulness (Wald = .40, $p$ = .52, CI [.69, 2.10], exp($B$) = 1.20) or depletion (Wald = 2.56, $p$ = .20, CI [.90, 2.82], exp($B$) = 1.59).

Given the importance of participant's sex in predicting the results, we repeated the censored survival analyses separately by sex. A different effect of depletion and mindfulness induction on maximum blast latency occurred (Figure 5.4).

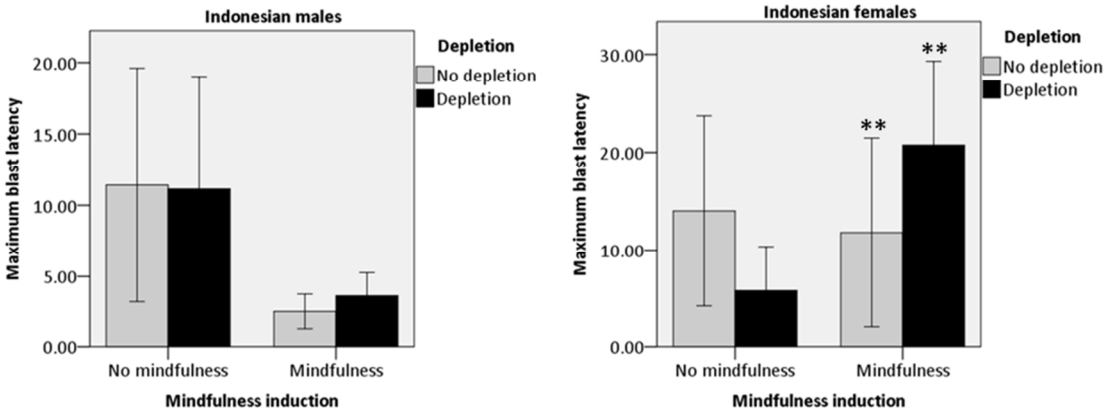


Figure 5.4 Sex differences in maximum blast latency. Error bars represent standard error of mean, asterisk indicates that participants waited significantly longer ($p$ < .01) before delivering the maximum blast.

For females ($n$ = 45), the final model was significant ($\Delta\chi^2$ = 8.88, $p$ < .05). Depleted females who received mindfulness induction were less likely to deliver the maximum blast earlier (Wald = 5.77, $p$ < .01, CI [.06, .75], exp($B$) = .21). There was also a significant main effect of mindfulness induction, in which females with mindfulness

induction tended to give the maximum blast later (Wald = 7.86, $p < .01$, CI [1.45, 8.20], exp(*B*) = 3.45), but no effect of depletion (Wald = 2.62, $p = .11$, CI [.86, 4.85], exp(*B*) = 2.04) on maximum blast latency.

For males ($n = 53$), the final model was not significant ($\Delta\chi^2 = 6.40$, $p = .09$). Maximum blasts latency was not predicted by depletion (Wald = .39, $p = .53$, CI [.60, 2.73], exp(*B*) = 1.27), mindfulness (Wald = 2.11, $p = .15$, CI [.24, 1.24], exp(*B*) = .55), or interaction between conditions (Wald = .43, $p = .51$, CI [.23, 2.08], exp(*B*) = .69).

#### 5.4.5.3 Correlation between blast intensity and maximum blast latency

For participants who had delivered the maximum blast ($N = 98$), there were significant negative correlations between maximum blast latency and blast intensity across levels of provocation ($r = -.57$, $p < .0001$ on no provocation, $r = -.52$, $p < .0001$ on low provocation, and $r = -.22$, $p < .05$ on high provocation). This finding supported the conclusion that higher blast intensity was delivered by those who delivered the maximum blast to the opponent earlier in the TCRT. A similar pattern of results emerged when we broke down the effect by sex, except for blasts delivered under high provocation. Specifically, the correlation between maximum blast latency and blast intensity on high provocation was non-significant for males ($r = -19$, $p = 18$), whereas it was marginally significant for females ($r = -.29$, $p < .052$)

### 5.4.6 Moderation of mindfulness induction on the link between depletion and indirect aggression

The moderation of mindfulness induction on the link between depletion and each indirect aggression item was analysed using a bootstrapping method, with 99% bias-corrected confidence intervals. Hypothesis 2c was not supported in that there was no significant effect of mindfulness induction on the link between depletion and indirect aggression in any ratings (Table 5.6). The main impact of depletion on rating of the opponent's aggressiveness (Hypothesis 1c) did not survive Bonferroni corrections ($p = .049$).

Table 5.6.
*Moderation models with bootstrapping method, using depletion as predictor, mindfulness as moderator, rating of opponent as outcome*

| Model tested | Aggressive | | Skilful | | Competitive | | Fair | | Play again | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* | *B* | *SE* | *B* | *SE* | *B* | *SE* |
| Depletion ($c_1$) | .50* | .35 | .44 | .24 | .26 | .28 | -.30 | .29 | -.14 | .25 |
| Mindfulness induction ($c_2$) | .13 | .25 | -.001 | .24 | -.02 | .28 | -.27 | .29 | .31 | .25 |
| Depletion x mindfulness ($c_3$) | .07 | .50 | -.27 | .49 | -.18 | .56 | .53 | .58 | .36 | .49 |
| $R^2$ on interaction | .02% | | .26% | | .09% | | .71% | | .45% | |

*Note. B* = unstandardised regression coefficient; *SE* = standard error; $R^2$ = variance increase
*$p < .05$; **$p < .01$; ***$p < .001$

As the opponent ratings did not differ by sex ($p$ = .11 to 61), moderation models were analysed for males and females together. Sex differences in ratings of indirect aggression are presented in Table 5.7.

Table 5.7.
*Sex differences based on rating of opponent*

| Indirect aggression | Males ($n$ = 52) | Females ($n$ = 58) | $t$ |
|---|---|---|---|
| | *M* (*SD*) | *M* (*SD*) | |
| Aggressive | 4.73 (1.46) | 4.87 (1.31) | $t(117) = -.54$, $p = .59$ |
| Skilful | 4.78 (1.34) | 4.92 (1.33) | $t(117) = -.56$, $p = .58$ |
| Competitive | 4.14 (1.50) | 4.25 (1.56) | $t(117) = -.41$, $p = .68$ |
| Fair | 5.05 (1.64) | 5.52 (1.49) | $t(117) = -1.62$, $p = .11$ |
| Play again | 5.63 (1.43) | 5.50 (1.26) | $t(117) = .52$, $p = .61$ |

*$p < .05$; **$p < .01$; ***$p < .001$

The moderation of mindfulness on the depletion and ratings of the opponent aggressiveness, skill, and participants willingness to play against the same opponent again were repeated by controlling significantly associated personality variables (see again Table 4.2, no covariates could be proposed for ratings of opponent competitiveness or fairness). As shown in Table 5.8, no significant effect of experimental conditions on ratings for these items were found (Hypothesis 3). Depleted participants continued to rate the opponent as being more "aggressive" than non-depleted ones, but this effect did not survive Bonferroni corrections. For covariates that survived Bonferroni corrections, those who were higher in negative affect following the depletion task rated the opponent as being more "skilful",

whereas those higher in hostility and positive affect after the TCRT task indicated a greater willingness to take a part in a task with the same opponent again (Table 5.8).

Table 5.8.
*Moderation models with bootstrapping method, using depletion as predictor, mindfulness as moderator, rating of opponent as outcome, controlling for covariates*

| Model tested | Aggressive | | Skilful | | Play again | |
|---|---|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* | *B* | *SE* |
| Depletion ($c_1$) | .47 | .24* | .27 | .24 | -.04 | .23 |
| Mindfulness induction ($c_2$) | .07 | .24 | .09 | .24 | .19 | .23 |
| Depletion x mindfulness ($c_3$) | -.18 | .49 | -.45 | .46 | .08 | .45 |
| $R^2$ on interaction | .11% | | .70% | | .02% | |
| Covariates: | | | | | | |
| AQ Physical aggression | -.39 | .21 | -.43 | .20* | - | - |
| AQ Verbal Aggression | -.30 | .20 | - | - | - | - |
| AQ Hostility | - | - | - | - | .46 | .18** |
| STAR Provocations | - | - | -.32 | .16* | - | - |
| PANAS PA1 | .36 | .29 | - | - | -.07 | .27 |
| PANAS NA1 | - | - | .86 | .26** | - | - |
| PANAS PA2 | .22 | .27 | - | - | .76 | .25** |

*Note. B* = unstandardised regression coefficient; *SE* = standard error; $R^2$ = variance increase
*$p < .05$; **$p < .01$; ***$p < .001$

### 5.4.7 Correlation between blast intensity and indirect aggression

No significant correlations were found between blast intensity and ratings of indirect aggression ($p$ =.17 to .99). An equivalent pattern was also found when we broke down the correlations by sex.

### 5.4.8 Moderation of mindfulness induction on the link between depletion and self-control performance

Table 5.9 shows the changes self-control performance/handgrip stamina prior to the TCRT task (Change 1) and post-TCRT task (Change 2). Both changes were positively correlated ($r$ = .62, $p < .0001$).

Table 5.9.
*Overall change in handgrip performance*

| | Depletion | | No depletion | |
|---|---|---|---|---|
| | Change 1 | Change 2 | Change 1 | Change 2 |
| Mindfulness induction | 6.87 | -7.30 | 7.03 | -1.07 |
| No mindfulness | -15.76 | -18.65 | -3.87 | -9.07 |

*Note*. Higher positive scores indicate better self-control on all measures. Values represent the changes in mean time that participants squeezed the handgrip pre-TCRT task (Change 1) and post-TCRT task (Change 2).

The hypothesised covariates (i.e., curiosity and decentering at Change 1; sex and SF at Change 2; see again Table 5.2) were entered into the moderation models (Table 5.10). As expected (Hypothesis 4a), at Change 1, depleted participants who received mindfulness induction outperformed depleted ones with no induction. The predicting role of curiosity and decentering was not significant. The moderation of mindfulness on the depletion and handgrip performance link did not persist after the TCRT task. Specifically, at Change 2, a better handgrip performance was shown by non-depleted participants, those who received mindfulness induction, females, and those higher in SF—thus Hypothesis 4b could not be supported. Sex differences in handgrip stamina are shown in Figure 5.5.

Table 5.10.
*Moderation models with bootstrapping method, using depletion as predictor, mindfulness as moderator, changes in handgrip performance as outcome, controlling for covariates*

| Model tested | Change 1 | | Change 2 | |
|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* |
| Depletion ($c_1$) | -6.21$^{*}$ | 2.86 | -7.25$^{**}$ | 2.68 |
| Mindfulness induction ($c_2$) | 15.74$^{***}$ | 2.92 | 10.35$^{***}$ | 2.68 |
| Depletion x mindfulness ($c_3$) | 11.90$^{*}$ | 5.70 | 3.93 | 5.33 |
| $R^2$ on interaction | 2.73% | | .36% | |
| Conditional effect of depletion without mindfulness | -12.21$^{**}$ | 4.05 | | |
| Conditional effect of depletion with mindfulness | -.31 | 4.02 | | |
| Covariates: | | | | |
| TMS curiosity | 2.74 | 3.31 | - | - |
| TMS decentering | -1.32 | 3.75 | - | - |
| STAR Frustrations | - | - | 3.86* | 1.69 |
| Sex | - | - | 6.38* | 2.74 |

*Note. B* = unstandardised regression coefficient; *SE* = standard error; $R^2$ = variance increase
Change 1 = mean time differences between handgrip duration at baseline and pre-TCRT task; Change 2 = mean time differences between handgrip duration at baseline and post-TCRT task
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

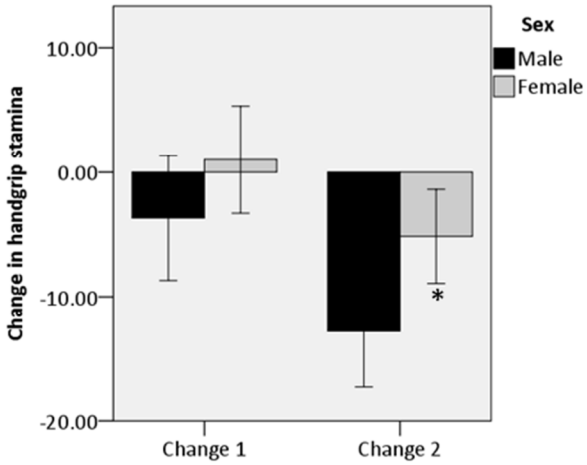


Figure 5.5. Sex differences in handgrip stamina. Higher positive scores indicate better self-control in Change 1 (pre-TCRT task) and Change 2 (post-TCRT task). Error bars represent standard error of mean, asterisk indicates significant ($p < .05$) sex differences in handgrip stamina.

## 5.5 DISCUSSION

### 5.5.1 Effect of mindfulness induction on aggressive behaviour following depletion

The current study is a cross-cultural replication of Study 3, using 119 (60 females) Indonesian university students. Before discussing the effect of experimental manipulations on aggressive behaviour, we should acknowledge that the absence of correlation between levels of provocation and blast intensity in the current sample is quite unusual in the TCRT experiments (e.g., Anderson et al., 2008; Lawrence & Hutchinson, 2013a, 2013b; also our results from Study 2 and 3). This finding was not inflated by prior depletion condition (i.e., no differences in overall blast intensities between depleted and non-depleted participants). Whilst the validity studies of the Taylor paradigm have been conducted in Western countries (e.g., Giancola & Parrott, 2008), our result indicates the possibility that the TCRT task may be less sensitive to activate differential levels of provoked aggression in the Indonesian sample.

The lack of sensitivity to the TCRT method was also suggested by the non-significant correlation between blast intensity and individual differences in sensitivity to provocations (SP). SP was shown to be related to blast intensity under provoked aggression in the British sample (also in Study 2 and in Lawrence & Hutchinson, 2013b), but was not related to blast intensity delivered here in the Indonesian

sample. Altogether, these notable divergences need to be examined by statistically comparing the data from British and Indonesian samples directly, which will be performed in the next chapter.

Crucially, our main analysis showed that mindfulness induction significantly moderated the link between ego-depletion and blast intensity on low provocation. This finding reiterates the result from the British sample, suggesting that the benefits of mindfulness in counteracting the effect of depleted self-control resource on direct physical aggression may operate similarly across cultures. Controlling for covariates (i.e., sex and positive affect) provided further support for the moderation model under high provocation.

As found in the British sample, being Indonesian male also increased the likelihood of higher levels of blast intensities on no provocation and low provocations, but the effect of sex diminished on high provocations. This finding is in line with Bettencourt and Miller's (1996) meta-analysis in the Western cultures. Bettencourt and Miller concluded that for females, the differences between aggression under provocation and neutral conditions are expected to be larger than for males, indicating the importance of provocation as a moderator of sex differences in aggression. Thus justification to display aggressive behaviour that is normally held in check by sex role norms appears to work similarly for females across cultures.

The benefit of mindfulness induction on the maximum blast latency following depletion was noticeable in particular for females. Specifically, depleted Indonesian females who received mindfulness induction were less likely to deliver the maximum blast earlier compared to depleted females with no mindfulness induction. Thus for females, mindfulness induction reduced physical aggression in both the explicit form (i.e., blast latency) and the subtle/implicit form (i.e., blast latency); whereas for males, reductions in aggression due to mindfulness induction occurred mainly in the explicit form of aggression. Whether this result truly reflects that mindfulness interventions would be more beneficial for females than for males aggression will also be elaborated in the next chapter, since in the British female sample, mindfulness *increased* the likelihood of delivering the maximum blast earlier.

Ratings of indirect aggression (reputation damage of the opponent) did not differ by sex, similar to the finding from the British participants. Moreover, mindfulness induction did not moderate the link between depletion and these ratings. Those who were higher in negative affect following the depletion task rated the opponent as being more "skilful", whereas those higher in hostility and positive affect after the TCRT task indicated a greater willingness to take a part in a task with the same opponent again. However, these findings were not consistent across all evaluations.

In addition, data from the World Health Organization (WHO, 2008) revealed the epidemiological profile of suicidal behaviour in Asia typically differs from that of the Western countries, in which impulsiveness is the major risk factor for suicide in Asia, whereas suicide in Western countries often involves depression and alcohol abuse. Therefore, a differential effect of self-harm on aggression is plausible across cultures. However, as in the British sample, neither direct nor indirect aggression in the Indonesian sample was related to self-harm, even though self-harm was positively associated to most of the self-reported measures of aggression. This result implies that the TCRT task, although performed following depletion condition, may still have not activated the potential link between self-harm and aggression across cultures.

### 5.5.2 Effect of mindfulness induction on self-control performance following depletion

Mirroring the effect of mindfulness induction on direct aggression following depletion, depleted participants with mindfulness induction also showed a better self-control performance (assessed by changes in handgrip duration relative to baseline) than depleted participants with no mindfulness induction when self-control performance was measured prior to the TCRT task. There was also a positive main effect of mindfulness induction and a usual main effect of depletion condition on self-control performance. This strengthens the conclusion of the benefit of mindfulness induction in the context where individuals lack self-control resource, by fostering a higher resistance to depletion.

While the main effect of mindfulness and depletion persisted when self-control performance was measured after the experience of provocation during the TCRT, the moderation of mindfulness did not survive. At this point, the effect of mindfulness on self-control performance was no longer dependent upon individuals having been subjected to the ego-depletion condition. A similar result was obtained in the British sample, whereas in Study 2 we found a crossover interaction between mindfulness induction and self-control training on self-control performance (i.e., participants receiving mindfulness induction only or self-control training only showed a better handgrip power than those who received either both conditions or no condition). It seems that the short-term effect of brief mindfulness inductions would not hold up for an extended period of time in particular when people have experienced provocation. In addition, females and those higher in sensitivity to frustrations demonstrated increased final self-control performance.

### 5.5.3 Strengths and limitations of the current study

The current study provides exploration of Western's operationalisation of mindfulness, self-control, aggression, and self-harm in the context of an Asian culture, particularly Indonesian. As found in the British sample, the 15-min mindfulness breathing exercise increased mindfulness state of decentering, but not curiosity. The attention control task was also effective to induce depletion (higher ratings in attention control and difficulty of the task). Further, no changes were found in postdepletion mood, dovetail with past research demonstrating that depletion manipulations have no impact on mood (e.g., Baumeister et al., 1998; Muraven et al., 1998; Stucke & Baumeister, 2006). Thus in general, the conditions for the mindfulness induction and depletion task were comparable across cultures. Crucially, replicating the outcomes from British sample, the impact of mindfulness induction was established in the Indonesian sample in terms of reduced in blast intensity following depletion.

Due to time and resources constraints, we did not precisely follow the recommended guidelines for cross-cultural adaptation of the translated instruments (e.g., Beaton, Bombardier, Guillemin, & Ferraz, 2000; Gjersing, Caplehorn, & Clausen, 2010). After the initial translation and synthesis of the measures by two postgraduate Indonesian students, the back translation of the questionnaires was provided through a commercial translation service instead of using translators with English mother tongue. Although the adapted measures were then pre-tested (with 2 pilot participants), no additional testing on the psychometric properties of the questionnaires was conducted. While the adapted measures might have reflected the content validity of the original measures, we could not provide any information with regards to the construct validity, reliability, or item response patterns.

Moreover, it would be difficult for this study to raise definitive conclusions about the role of provocations on aggression across cultures, or the efficacy of the Taylor paradigm outside of US and UK/European samples, due to the absence of association participants' responses to aggression and provocation level from the opponent. This issue will be detailed in the next chapter.

### 5.5.4 Conclusions and next steps

Consistent with the results from the British sample, the current study showed that the benefits of mindfulness on direct aggression may be more salient under depleted condition than under full self-control resources. Relatedly, the maximum blast latency seems to capture females' aggression, and females outperformed males in self-control performance. No influence of experimental conditions was found on indirect aggression (reputation damage to the opponent). The following chapter will focus on the strength of the effect of mindfulness induction across cultures.

# CHAPTER SIX

# Cross-cultural comparison of the effect of mindfulness induction on aggressive behaviour following depletion (British vs. Indonesian sample)

## 6.1 INTRODUCTION

The current chapter examines cross-cultural comparison between the native British (Study 3) and Indonesian participants (Study 4). The comparison is made based on cultural differences in (i) the strength of the effect of mindfulness induction on experimental outcomes (i.e., blast intensity, maximum blast latency, indirect aggression, and self-control performance) under depleted self-control resources, and (ii) personality variables.

### 6.1.1 Cultural differences in the effect of mindfulness induction on aggressive behaviour following depletion

Past research employing the Taylor Competitive Reaction Time (TCRT: Taylor, 1967) task has typically demonstrated significant positive effects of levels of provocation from the opponent on participants' levels of blast intensity (e.g., Anderson et al., 2008; DeWall et al., 2010; Konrath et al., 2006; Lawrence & Hutchinson, 2013a, 2013b). This standard provocation effect was shown in the British sample, but not in the Indonesian sample. As this is of the first study we know to employ the TCRT task in Indonesia, it is difficult to conclude whether the Indonesian subjects were simply less responsive to physical provocation (i.e., loud blasts), or whether they were more behaviourally aggressive *per se*—and so operating at ceiling type levels for them. The current analysis directly examines the differences between Indonesian and British participants' responses to aggression under provocation and at baseline level.

The key analysis in this chapter concerns whether mindfulness as a moderator of the depletion and aggression link varies as a function of culture. In other words, we are interested in testing whether culture moderates the moderation of mindfulness on the depletion and aggression relationship. As presented in the two previous chapters, under low provocation trials, both depleted Indonesian and British participants who received mindfulness induction displayed lower levels of blast intensity as opposed to their depleted counterparts with no mindfulness induction. This effect was also found under no provocation for the British, but not for the Indonesians. The effect for the Indonesians occurred on high provocation after controlling for positive affect (although positive affect did not predict blast intensity). While we expect the benefit of mindfulness to hold regardless of the cultural context, the effect might be stronger in the Indonesians as they are more familiar to the concepts of mindfulness, or in the British as the novelty factor of this technique may produce an increasing effect. On the other hand, the main effect of cultures may occur in direct aggression. As the general collectivism culture in Indonesia strongly prohibits display of aggression (Koentjaraningrat, 1985; Magnis-Suseno, 1997), the Indonesian sample may display less blast intensities in general.

Previous analyses showed that for both cultures, no support was found for the proposed depletion x mindfulness model on maximum blast latency (the delay duration before the maximum aggressive response was delivered). However, after the inclusion of participants' sex, depleted Indonesian participants with mindfulness induction, and Indonesian females were less likely to deliver maximum blast to the opponent. The opposing effect was evident for British females. These findings suggest the necessity to include participants' sex, and that mindfulness intervention may be more effective to undermine the Indonesian females' aggression in terms of maximum blast latency than British females. So, like blast duration (Giancola & Parrott, 2008), blast latency may be operating as an indirect measure of aggression for British females, but more akin to direct aggression for Indonesian females.

Previous analyses also showed the lack of efficacy of mindfulness induction in counteracting the effect of depletion on indirect aggression (anonymous reputation damage to the opponent) for both the British and Indonesian samples. Relatedly, it has been shown elsewhere that the presence of collectivism value could limit the exhibition of indirect aggression (Forbes et al., 2009), but may also increase the tendency to adopt this method (French et al., 2002). Therefore, cultural differences in the effectiveness of mindfulness induction as well as the main effect of culture on indirect aggression may be less observable in the current analysis.

It should be noted, however, that sex differences occurred in French et al.'s (2002) study comparing descriptions of disliked peers by the Indonesian and US youth (in Hofstede's, 2010 map of individualism, the US receives a score 91, almost equal to the UK). In both countries, boys associated disliked peers with their exhibition of physical aggression by these peers, whereas girls associated these peers with relational aggression more often than boys. According to French et al., a disliked peer could be described as engaging in certain behaviour because the behaviour occurs frequently—thus confirming a typical sex differences in direct and indirect aggression across cultures; or conversely, because the behaviour is so infrequent that it is particularly salient or socially unacceptable. In other studies, however, sex was shown as a weak contributor to indirect aggression amongst college students in the US (individualist) and China (collectivist: Forbes et al., 2009), suggesting that cross-culturally sex differences in indirect aggression may be less observable in adults than in younger population. Thus in the current analysis, no strong prediction is made with regards to sex differences in indirect aggression a function of culture.

### 6.1.2 Cultural differences in the effect of mindfulness induction on self-control performance following depletion

A noticeable cultural difference may occur on the link between depletion and self-control performance (handgrip stamina). Apart from past evidence that collectivism

cultures promote a better resistance to ego-depletion (Balliet & Joreiman, 2010; Seeley & Gardner, 2003; see also Baumeister, Vohs, et al., 2007), our previous analyses showed that mindfulness induction did increase self-control performance following depletion for the Indonesian sample, but not for the British. Therefore, a stronger moderation effect of mindfulness is expected to favour the Indonesians.

Consistent with the above prediction, the main effect of culture on the link between depletion and self-control performance is also expected to be stronger in the Indonesian than in the British sample. In addition, the previous chapters consistently revealed that females in both cultures were more able to maintain their baseline handgrip performance than counterparts male. Thus it may be that cultural differences in self-control performance would be less pronounced for females.

### 6.1.3 Cultural differences in personality variables

Individual differences in sensitivity to provocations (SP) was positively associated to blast intensity under *provoked aggression* in the British sample (also in Study 2 and in Lawrence & Hutchinson, 2013b), but not in the Indonesian sample. The current analysis allows us to examine the extent to which provocations and frustrations sensitivity (SF) is similar in both cultures, since no studies examining the reliability and validity of the SP or SF in a non-Western context have been conducted to date.

Cultural differences in the overt or behavioural component of aggression have been reported elsewhere (e.g., Forbes et al., 2009; Ramirez et al., 2001). This implies that the Indonesian people may possess fewer propensities to behave aggressively, particularly in terms of physical and verbal aggression. This could also mean that the Indonesians may be more sensitive to signals of aggression than the British people. Alternatively, even though females are commonly more socialised to inhibit their exhibition of aggression, they generally score the same as their male counterparts on measures of both SP and SF (Lawrence, 2006), as well as on anger and hostility (Archer, 2004). Therefore, in the same way, the Indonesian sample, while having

strong social sanctions to limit the exhibition of aggression behaviour, may score similarly in terms of trait aggression, anger, hostility, SP and SF, but may score lower in trait physical and verbal aggression.

The current analysis also compares cultural differences in the individual's propensity to be mindful and self-controlled. Compared to the British, the Indonesian people, particularly Javanese Indonesians are already accustomed to mindful ways of thinking in daily life (Koentjaraningrat, 1989). Thus a higher level of trait mindfulness is expected for the Indonesians. However, cultural differences in trait self-control would be less expected, because self-controlled regulation of personal goals is prevalent in individualistic societies (Brown et al., 2007a), but compliance with societal norm is promoted in the collectivists (Hofstede, 1980, 2010; Triandis, 1995).

In addition, we also analyse cultural differences in the prevalence of self-harm. Suicidal behaviour in developing countries in Asia has been typically underreported, due to various religious, legal and cultural constraints (Kahn, 2005; Vijayakumar, 2004). However, a recent study with university students in Indonesia reported a 38% lifetime prevalence of self-harm, comparable with Gratz's (2001) study using students in the US (Tresno, Ito, & Mearns, 2012). Thus we proposed no specific prediction with regards to the prevalence of self-harm across the current samples.

It should be underlined that the assessment of the role of individual differences in mindfulness, self-control, aggression, self-harm, SP, and SF as covariate has been conducted separately in Chapter 4 and 5, so the current analysis focuses only on cultural differences in the aforementioned traits.

## 6.2 HYPOTHESES

The cross-cultural analyses examine the following hypothesis:

1. For personality traits across cultures:

a. Indonesians will show higher levels of trait mindfulness than the British. No strong prediction will be made for cultural differences in trait self-control.
b. Indonesians will show lower levels of trait physical and verbal aggression than the British. No strong prediction will be made for cultural differences in general trait aggression, anger, and hostility.
c. No strong prediction will be made for cultural differences in sensitivity to provocations (SP) and frustrations (SF).
d. No strong prediction will be made for cultural differences in self-harm.

2. For direct aggression in terms of blast intensity delivered to the opponent:
    a. Compared to British participants, Indonesians will deliver lower levels of blast intensity. Blast intensity is measured across three provocation levels (i.e., no provocation, low provocation, high provocation).
    b. The moderation of mindfulness on the depletion and blast intensity link will be expected to hold regardless of culture, but could either be stronger for Indonesians participants or for the British.
3. For maximum blast latency:
    a. No cultural differences will be expected in the maximum blast latency. Cultural differences may occur with the inclusion of participants' sex, in which Indonesian females will wait longer before delivering the maximum blasts to the opponent than the British counterparts.
    b. No specific prediction will be made for cultural differences in the moderation of mindfulness on the depletion and maximum blast latency link. After the inclusion of participants' sex, cultural differences are expected to favour depleted Indonesians than the British participants.
4. For indirect aggression (anonymous reputation damage to the opponent):
    a. No cultural differences will be expected in indirect aggression. Additionally, no specific prediction is made for cultural differences in indirect aggression across sexes.

b. No specific prediction will be made for cultural differences in the moderation of mindfulness induction on the depletion and indirect aggression link.

5. For self-control performance (changes in handgrip stamina):
    a. Compared to British participants, Indonesians will be more able to maintain their self-control performance. Cultural differences in self-control performance may be more observable in males than in females.
    b. Cultural differences in the moderation of mindfulness induction on the depletion and self-control performance link will be expected to favour Indonesians than British participants.

## 6.3 METHODS

### 6.3.1 Participants

The final cross-cultural sample consisted of 119 Indonesian and 110 native British university students. The numbers of males and females in each experimental condition (2 [ego-depletion vs. no depletion] x 2 [mindfulness induction vs. no induction] are shown in Table 6.1 (see section 4.3.4, Chapter 4 for details of the experimental manipulations).

Table 6.1.
*Frequency distributions for cross-cultural analysis*

| Depletion | | Mindfulness induction | |
|---|---|---|---|
| | | Mindfulness | No mindfulness |
| Depletion | Indonesian | 30 (15 M, 15 F) | 29 (14 M, 15 F) |
| | British | 28 (13 M, 15 F) | 27 (13 M, 14 F) |
| No depletion | Indonesian | 30 (15 M, 15 F) | 30 (15 M, 15 F) |
| | British | 27 (14 M, 13 F) | 28 (12 M, 16 F) |

*Note.* M = Males; F = Females

### 6.3.2 Data analysis

A series of independent *t*-tests, one-way ANOVAs, and Chi-square tests was performed to test cross-cultural differences in personality variables (Hypothesis 1a, 1b, 1c, and 1d). The moderation of mindfulness and culture on the link between depletion and aggressive behaviour and self-control performance was tested with bootstrapping method, using model "number 3" in A. F. Hayes's (2012a) PROCESS macro for three-way interaction (moderated moderation).

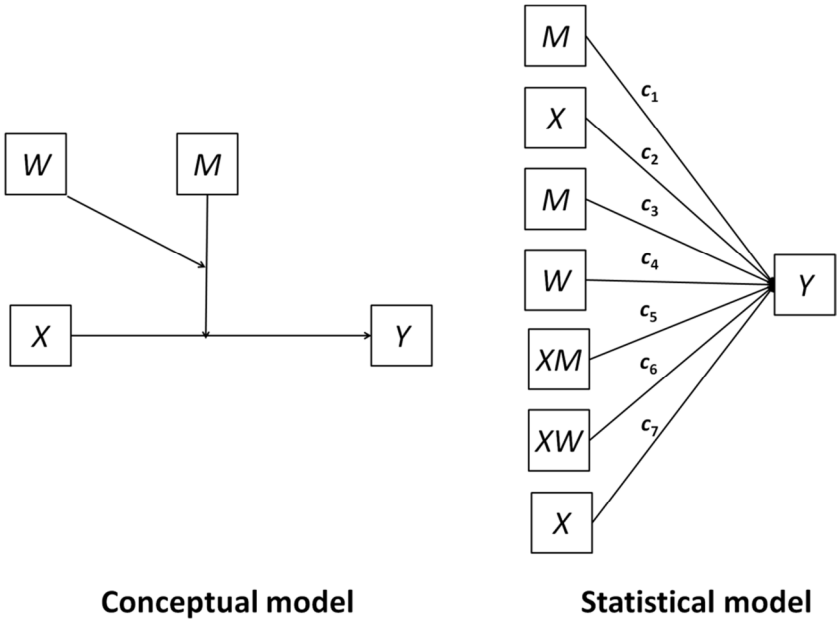


Figure 6.1. Conceptual and statistical models for moderated moderation. *X* = predictor (depletion), *Y* = outcome (aggression or self-control performance), *M* = first moderator (mindfulness), *W* = second moderator (culture). $c_1$, $c_2$, $c_3$, $c_4$, $c_5$, $c_6$, $c_7$ = unstandardised regression coefficient. Reprinted from A. F. Hayes (2012b, p.33).

In a moderated moderation model, the effect of *X* on *Y* depends multiplicatively on *M* and *W* (Figure 6.1). The model is proposed mathematically as: $Y = i + c_1X + c_2M + c_3W + c_4XM + c_5XW + c_6MW + c_7XMW + e_y$. Three-way interaction is present if *c*7 is statistically different from zero. Alternatively, the analysis can focus on the conditional two-way interaction between *X* and *M* as moderated by $W = c_4 + c_7W$. This can be understood by selecting values of *W* and testing whether the conditional interaction between *X* and *M* is statistically different from zero at those values.

In the current analysis, the moderated moderation model allows us to test whether the conditional two-way interaction between mindfulness and depletion would be statistically different from zero at the value of culture, on (i) blast intensity on each provocation levels (Hypothesis 2b), (ii) maximum blast latency (Hypothesis 3b), (iii) anonymous reputation damage of the opponent (Hypothesis 4b), and (iv) change in handgrip stamina pre- and post-TCRT task (Hypothesis 5b) as the outcomes. Additionally, this model also predicts the main effect of culture on the aforementioned outcomes (Hypothesis 2a, 3a, 4a, and 5a).

## 6.4 RESULTS

### 6.4.1 Cultural differences in personality variables

Table 6.2.
*Cross-cultural differences in personality measures*

| Personality measures | Indonesian | British | *t* |
|---|---|---|---|
| | *M* (*SD*) | *M* (*SD*) | |
| MAAS | 3.93 (.57) | 3.72 (.70) | $t(227) = 2.53^{**}$ |
| SCS | 3.14 (.46) | 3.05 (.56) | $t(212.28) = 1.25$, $p = .21$ |
| Total AQ | 2.76 (.45) | 2.43 (.57) | $t(207.70) = 4.75^{***}$ |
| AQ Physical | 2.14 (.61) | 2.05 (.83) | $t(199.58) = .95$, $p = .34$ |
| AQ Verbal | 3.14 (.63) | 2.88 (84) | $t(201.87) = 2.67^{**}$ |
| AQ Anger | 2.67 (.76) | 2.22 (.72) | $t(227) = 4.55^{***}$ |
| AQ Hostility | 3.09 (.64) | 2.56 (.79) | $t(210.90) = 5.28^{***}$ |
| STAR Provocations | 2.92 (.78) | 2.88 (.78) | $t(227) = .30$, p = .77 |
| STAR Frustrations | 2.76 (.82). | 2.54 (.76) | $t(227) = 2.15^{*}$ |

*Note*. MAAS = Mindful Attention Awareness Scale; SCS = Self-Control Scale; AQ = Aggression Questionnaire; STAR = Situational Triggers of Aggressive Responses
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

Only one British participant reported practicing mindfulness (on a monthly basis), whereas none of the Indonesians reported having encounters with these experiences. Table 6.2 depicts the cross-cultural comparison in personality measures. As expected, compared to British participants (*N* = 110), the Indonesians (*N* = 119) scored significantly higher on trait mindfulness, but not on trait self-control

(Hypothesis 1a). No support was found for Hypothesis 1b, as the Indonesians scored higher in verbal aggression, but similar to the British in physical aggression. In fact, the Indonesians also scored higher in general trait aggression, anger, and hostility. Hypothesis 1c was partially supported in that equal level of sensitivity to provocation (SP) was reported between cultures, although the Indonesian sample was higher in sensitivity to frustrations (SF). Supporting Hypothesis 1d, self-harm did not vary as a function of culture ($\chi^2(1) = 3.34$, $p = .07$), although the rate of self-harm in the Indonesians tend to be higher (*n* Indonesian = 22 [66.7% of total]; *n* British = 11 [33.3% of the total]). In short, compared to the British, the Indonesians were more mindful, equally self-controlled, and more aggressive in feelings.

Additionally, sex differences occurred for physical aggression, ($F(1,225) = 21.29$, $p < .0001$; *M* males = 2.31, *SD* = .80 vs. *M* females = 1.89, *SD* =.57), anger ($F(1,225) = 4.97$, $p < .05$; *M* males = 2.35, *SD* = .76 vs. *M* females = 2.56, *SD* =.77), and SF ($F(1,225) = 12.37$, $p < .001$; *M* males = 2.47, *SD* = .78 vs. *M* females = 2.83, *SD* =.78). Comparable rates of self-harm were shown between males and females ($\chi^2(1) = .57$, $p = .45$; *n* males = 14 [42.4% of the total]; *n* females = 19 [57.6% of the total]). No significant interactions were found between sex and culture on the trait measures ($p = .09$ to .99). Thus males and females across cultures reported a comparable pattern of results with regards to the tendency to harm themselves and others.

### 6.4.2 Cultural differences in the moderation of mindfulness induction on the link between depletion and aggressive behaviour

#### 6.4.2.1 Levels of blast intensity

A bootstrapping method with 95% bias-corrected confidence intervals (based on 5,000 bootstrap resamples, $N = 229$) was employed to test the moderated moderation model. All predictors were mean-centered. Results in Table 6.3 show comparable effectiveness of the mindfulness intervention for the depleted group across both samples (Hypothesis 2b: $c7$, $p = .61$ to .98). Regardless of culture,

mindfulness moderated the link between depletion and blast intensities in all provocation levels ($c_4$), in which both depleted Indonesian and British participants with mindfulness induction delivered lower levels of blast intensity than depleted ones with no mindfulness induction. Under no provocation and low provocation, lower blast intensity was also delivered by mindfulness induction ($c_2$) and non-depleted ($c_1$) participants. Contrary to Hypothesis 2a ($c_3$), Indonesians delivered higher blast intensities than British across all provocation levels (see Figure 6.2).

Table 6.3.
*Moderation models with bootstrapping method, using depletion as predictor, mindfulness and culture as moderator, blast intensity as outcome*

| Model tested | No provocation | | Low provocation | | High provocation | |
|---|---|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* | *B* | *SE* |
| Mindfulness induction ($c_2$) | -.72** | .30 | -.48* | .24 | -.47 | .41 |
| Depletion ($c_1$) | .75** | .30 | .63** | .24 | .47 | .41 |
| Depletion x mindfulness ($c_4$) | -1.58** | .60 | -1.41** | .49 | -1.24* | .54 |
| Culture ($c_3$) | -3.00*** | .30 | -1.93*** | .24 | -1.24*** | .27 |
| Depletion x culture ($c_5$) | .93 | .60 | -.02 | .49 | -.10 | .54 |
| Mindfulness x culture ($c_6$) | -.44 | .60 | -.27 | .49 | -.28 | .54 |
| Depletion x mindfulness x culture ($c_7$) | -.62 | 1.20 | -.27 | .97 | -.02 | 1.07 |
| $R^2$ on three-way interaction | .08% | | .03% | | 0% | |
| Conditional effect of mindfulness x depletion for Indonesians | -1.28 | .84 | -1.28 | .67 | -1.23 | .74 |
| Conditional effect of mindfulness x depletion for British | -1.90* | .87 | -1.55* | .70 | -1.25 | .77 |

*Note. B* = unstandardised regression coefficient; *SE* = standard error; $R^2$ = variance increase
*$p < .05$; **$p < .01$; ***$p < .001$

In addition, both Indonesian males and females delivered higher blast intensities across all provocation levels relative to their British counterparts (Table 6.4). Thus cultural differences in direct aggression were consistently shown across sexes.

Table 6.4.
*Means for blast intensity across culture and sex*

| Blast intensity | Sex | Indonesian | | British | | *t* |
|---|---|---|---|---|---|---|
| | | *M* | *SD* | *M* | *SD* | |
| No provocation blast | Male | 6.03 | 2.05 | 3.06 | 2.89 | $t(90.56) = 6.18$*** |
| | Female | 5.20 | 2.30 | 2.21 | 2.03 | $t(116) = 7.74$*** |

| Blast intensity | Sex | Indonesian | | British | | *t* |
|---|---|---|---|---|---|---|
| | | *M* | *SD* | *M* | *SD* | |
| | Total | 5.61 | 2.21 | 2.61 | 2.50 | $t(227) = 9.65^{***}$ |
| Low provocation blast | Male | 5.70 | 1.83 | 3.81 | 2.24 | $t(109) = 4.87^{***}$ |
| | Female | 4.94 | 1.67 | 3.00 | 1.69 | $t(116) = 6.29^{***}$ |
| | Total | 5.31 | 1.78 | 3.38 | 2.00 | $t(227) = 7.73^{***}$ |
| High provocation blast | Male | 5.49 | 2.17 | 4.35 | 2.29 | $t(109) = 2.68^{**}$ |
| | Female | 5.26 | 1.68 | 3.94 | 2.06 | $t(116) = 3.80^{***}$ |
| | Total | 5.37 | 1.94 | 4.14 | 2.17 | $t(227) = 4.55^{***}$ |

$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

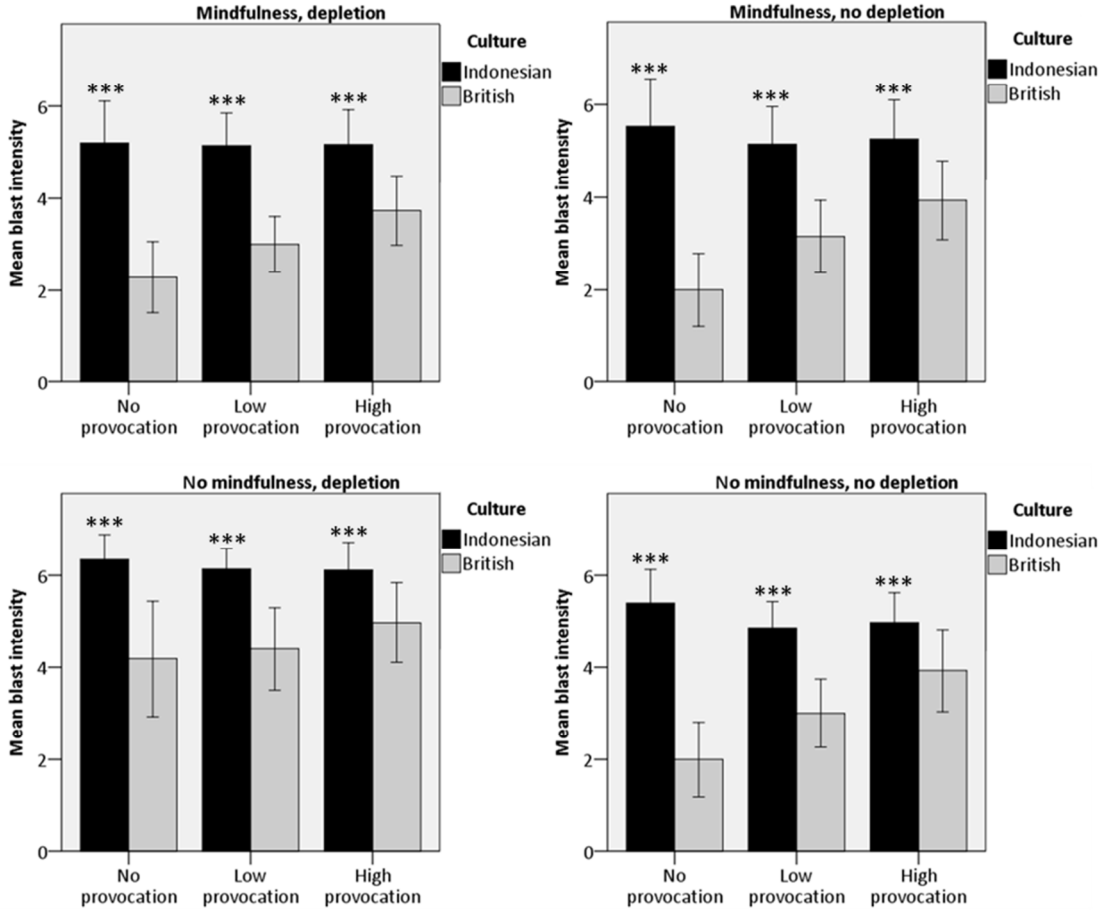


Figure 6.2. Cross-cultural comparisons of blast intensity based on experimental conditions (mindfulness and depletion). Error bars indicate standard error of mean. Scale goes up to 8 as a maximum.

#### 6.4.2.2 Maximum blasts latency

During the TCRT, the maximum blasts were delivered by 175 participants (98 Indonesian, 77 British). To support our prediction that no cultural differences would be shown in the moderation of mindfulness on the depletion and maximum blast latency link, we firstly carried out a censored survival analyses using Cox regressions. As expected, this proposed model was not significant ($\Delta\chi^2$ = 4.80, $p$ = .44). The likelihood of delivering maximum blast earlier was not predicted by interaction between mindfulness x depletion x culture (Hypothesis 3b: Wald = 2.81, $p$ = .09, CI [.25, 1.12], exp($B$) = .53). The main effect of culture (Hypothesis 3a: Wald = 2.48, $p$ = .12, CI = [.93, 1.87], exp($B$) = 1.32), mindfulness (Wald = .43, $p$ = .52, CI [.76, 1.73], exp($B$) = 1.15), and depletion (Wald = 1.28, $p$ = .26, CI [.83, 1.96]), exp($B$) = 1.28) as well as the interaction of mindfulness x depletion (Wald = .002, $p$ = .96, CI [.48, 2.01], exp($B$) = .98) on maximum blast latency were all non-significant.

To support the importance of sex differences on maximum blast latency, we repeated the censored survival analysis by including participants' sex into the model. The final model for depletion, mindfulness, culture, and sex on maximum blast latency was significant ($\Delta\chi^2$ = 17.40, $p$ < .01), with a significant three-way interaction between mindfulness x depletion x culture (Wald = 4.50, $p$ < .05, CI [.20, .94], exp($B$) = .44). Contrary to Hypothesis 3b, however, depleted British participants with mindfulness induction were less likely to deliver the maximum blast earlier than their Indonesian counterparts. Relatedly, the main effect of sex was also significant (Wald = 12.44, $p$ < .0001, CI [1.29, 2.41], exp($B$) = 1.15), but in the reverse direction to our prediction (Hypothesis 3a). Specifically, compared to females, males in both cultures waited longer before delivering the maximum blast. In addition, maximum blast latency was not predicted by the main effect of culture (Wald = 2.76, $p$ = .10, CI [.95, 1.90], exp($B$) = 1.34), mindfulness (Wald = .00, $p$ = .99, CI [.67, 1.51], exp($B$) = 1.00), and depletion (Wald = 1.20, $p$ = .26, CI [.78, 1.84], exp($B$) = 1.20), or by the interaction between mindfulness and depletion (Wald = .33, $p$ = .57, CI [.60, 2.57],

exp(*B*) = 1.24). The proposed model was not significant when males ($\Delta\chi^2$ = 5.73, *p* = .33) and females ($\Delta\chi^2$ = 4.92, *p* = .43) were analysed separately.

#### 6.4.2.3 Indirect aggression

Table 6.5.
*Moderation models with bootstrapping method, using depletion as predictor, mindfulness and culture as moderator, rating of opponent as outcome*

| Model tested | Aggressive | | Skilful | | Competitive | | Fair | | Play again | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* | *B* | *SE* | *B* | *SE* | *B* | *SE* |
| Mindfulness induction ($c_2$) | .04 | .17 | .03 | .17 | .07 | .18 | -.16 | .21 | .28 | .19 |
| Depletion ($c_1$) | .36 | .17$^{*}$ | .18 | .17 | .18 | .18 | .04 | .21 | -.09 | .19 |
| Depletion x mindfulness ($c_4$) | .05 | .35 | -.26 | .34 | -.11 | .37 | .22 | .43 | -.16 | .39 |
| Culture ($c_3$) | -.70$^{***}$ | .17 | .05 | .17 | .91$^{***}$ | .18 | -.72$^{***}$ | .21 | -.20 | .19 |
| Depletion x culture ($c_5$) | -.30 | .35 | -.53 | .34 | -.17 | .37 | .70 | .43 | .12 | .39 |
| Mindfulness x culture ($c_6$) | -.19 | .35 | .06 | .34 | .18 | .37 | .23 | .43 | -.07 | .39 |
| Depletion x mindfulness x culture ($c_7$) | -.04 | .70 | .02 | .68 | .14 | .74 | -.64 | .86 | -1.08 | .77 |
| $R^2$ on three-way interaction | 0% | | 0% | | .01% | | .24% | | .86% | |
| Conditional effect of mindfulness x depletion for Indonesians | .07 | .48 | -.27 | .47 | -.18 | .51 | .53 | .59 | .36 | .54 |
| Conditional effect of mindfulness x depletion for British | .03 | .50 | -.25 | .49 | -.04 | .53 | -.11 | .62 | -.72 | .56 |

*Note. B* = unstandardised regression coefficient; *SE* = standard error; $R^2$ = variance increase
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

We used bootstrapping analysis at 99% bias-corrected confidence intervals to survive Bonferroni corrections ($p < .01$). As expected, results in Table 6.5 shows no significant mindfulness x depletion x culture interaction on any of indirect aggression ratings (Hypothesis 4b: $c_7$, $p$ = .17 to .97). Corroborating the results from the two previous chapters, conditional two-way effect of mindfulness x depletion ($c_7$) was not significant for Indonesians ($p$ = .37 to .89), or for British participants ($p$ = .20 to

.95). The main positive effect of depletion occurred on rating of the opponent's aggressiveness ($c_1$), however, this effect was not strong enough to survive Bonferroni corrections ($p < .041$).

We did not propose specific prediction for the main effect of culture on indirect aggression (Hypothesis 4a). However, culture differences occurred in ratings of the opponent's aggressiveness, competitiveness, and fairness ($c_3$). As shown in Table 6.6, the Indonesians rated the opponent as being more aggressive, but also more fair and less competitive. No significant cultural differences were found in rating of the opponent's skill or in the willingness to play with the same opponent again. As an additional testing for Hypothesis 4a, a comparable pattern of results in rating of indirect aggression was obtained across sexes. Specifically, both Indonesian males and females rated the opponent as being more aggressive but less competitive than their British counterparts, but Indonesian females also rated the opponent as being more fair. Taken together, it can be concluded that Indonesian males and females showed comparable indirect aggression ratings with their British counterparts.

Table 6.6.
*Means for rating of opponent across culture and sex*

| Indirect aggression | Sex | Indonesian | | British | | *t* |
|---|---|---|---|---|---|---|
| | | *M* | *SD* | *M* | *SD* | |
| Aggressive | Male | 4.73 | 1.46 | 3.94 | 1.31 | $t(109) = 2.98^{**}$ |
| | Female | 4.87 | 1.31 | 4.24 | 1.16 | $t(116) = 2.75^{**}$ |
| | Total | 4.80 | 1.38 | 4.10 | 1.23 | $t(227) = 4.02^{***}$ |
| Skilful | Male | 4.78 | 1.34 | 4.75 | 1.37 | $t(109) = .12$, $p = .91$ |
| | Female | 4.92 | 1.33 | 5.03 | 1.08 | $t(116) = -.53$, $p = .60$ |
| | Total | 4.85 | 1.33 | 4.90 | 1.23 | $t(227) = -.30$, $p = .76$ |
| Competitive | Male | 4.14 | 1.49 | 4.87 | 1.31 | $t(109) = -2.72^{**}$ |
| | Female | 4.25 | 1.56 | 5.31 | 1.10 | $t(106.06) = -4.29^{***}$ |
| | Total | 4.19 | 1.52 | 5.10 | 1.22 | $t(222.64) = -5.00^{***}$ |
| Fair | Male | 5.05 | 1.64 | 4.40 | 1.87 | $t(109) = 1.94$, $p = .06$ |
| | Female | 5.52 | 1.49 | 4.71 | 1.41 | $t(116) = 3.03^{**}$ |
| | Total | 5.29 | 1.58 | 4.56 | 1.65 | $t(227) = 3.39^{***}$ |
| Play again | Male | 5.63 | 1.43 | 5.46 | 1.70 | $t(109) = .56$, $p = .58$ |
| | Female | 5.50 | 1.26 | 5.26 | 1.46 | $t(116) = .97$, $p = .34^{***}$ |

| Indirect aggression | Sex | Indonesian | | British | | *t* |
|---|---|---|---|---|---|---|
| | | *M* | *SD* | *M* | *SD* | |
| | Total | 5.56 | 1.34 | 5.35 | 1.57 | $t(227) = 1.08$, $p = .28$ |

$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

### 6.4.3 Cultural differences in the moderation of mindfulness induction on the link between depletion and self-control performance

Changes in self-control performance were calculated by the mean differences between handgrip stamina at baseline and prior to the TCRT task (Change 1) and post-TCRT task (Change 2). The result of the moderated moderation analysis is presented in Table 6.7. Contrary to Hypothesis 5b, there was no significant three-way interaction between mindfulness x depletion x culture at Change 1, ($c_7$: $B$ = -8.36, $SE$ = 9.05, $p$ = .09) or Change 2 ($c_7$: $B$ = -7.25, $SE$ = 8.67, $p$ = .40). A better handgrip performance at both time points was shown by those who received mindfulness induction or by non-depleted participants.

Table 6.7.
*Moderation models with bootstrapping method, using depletion as predictor, mindfulness and culture as moderator, changes in handgrip performance as outcome*

| Model tested | Change 1 | | Change 2 | |
|---|---|---|---|---|
| | *B* | *SE* | *B* | *SE* |
| Mindfulness induction ($c_2$) | 13.12*** | 2.26 | 8.92*** | 2.17 |
| Depletion ($c_1$) | -6.18** | 2.26 | -4.95* | 2.17 |
| Depletion x mindfulness ($c_4$) | 7.71 | 4.52 | -.13 | .98 |
| Culture ($c_3$) | -7.87*** | 2.26 | .55 | 2.17 |
| Depletion x culture ($c_5$) | -.37 | 4.53 | 6.14 | 4.34 |
| Mindfulness x culture ($c_6$) | -7.54 | 4.53 | -1.56 | 4.43 |
| Depletion x mindfulness x culture ($c_7$) | -8.36 | 9.05 | -7.25 | 8.67 |
| $R^2$ on three-way interaction | .30% | | .28% | |
| Conditional effect of mindfulness x depletion for Indonesians | 11.73 | 6.27 | 3.36 | 6.01 |
| Conditional effect of mindfulness x depletion for British | -3.37 | 6.53 | -3.89 | 6.25 |

*Note.* $B$ = unstandardised regression coefficient; $SE$ = standard error; $R^2$ = variance increase
Change 1 = mean time differences between handgrip duration at baseline and pre-TCRT task; Change 2 = mean time differences between handgrip duration at baseline and post-TCRT task
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

As expected (Hypothesis 5a), higher self-control performance at Change 1 was also influence by culture ($c_3$). Specifically, as can be seen in Table 6.8, regardless of experimental conditions, Indonesian participants were more able to maintain their handgrip performance than British participants at Change 1, although comparable performance was shown at Change 2. The main effect of culture at Change 1 (Indonesians outperformed British) was particularly pronounced for males, but not for females, thus lending an additional support for Hypothesis 5a.

Table 6.8.
*Overall change in handgrip performance across culture and sex*

| Blast intensity | Sex | Indonesian | | British | | *t* |
|---|---|---|---|---|---|---|
| | | *M* | *SE* | *M* | *SE* | |
| Change 1 | Male | -3.68 | 2.50 | -16.25 | 3.12 | $t(109) = 3.17^{**}$ |
| | Female | 1.02 | 2.15 | -3.02 | 1.68 | $t(110.48) = 1.48$, p = .14 |
| | Total | -1.31 | 1.66 | -9.27 | 1.83 | $t(227) = 3.24^{***}$ |
| Change 2 | Male | -12.80 | 2.24 | -12.87 | 3.10 | $t(109) = .02$, p = .98 |
| | Female | -5.15 | 1.89 | -4.53 | 1.47 | $t(110.41) = -.26$, p = .80 |
| | Total | -8.94 | 1.48 | -8.47 | 1.70 | $t(227) = .84$, p = .84 |

*Note*. Higher positive scores indicate better self-control on all measures. Values represent the changes in mean time that participants squeezed the handgrip pre-TCRT task (Change 1) and post-TCRT task (Change 2).
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

As a whole, the summary of findings from the current cross-cultural analysis, as well as from each sample is presented in Appendix 6.1.

## 6.5 DISCUSSION

### 6.5.1 Cultural differences in the effect of mindfulness induction on aggressive behaviour following depletion

The current analysis sought to compare the possible cultural differences in the effectiveness of mindfulness induction to counteract the negative impact of depletion on aggressive behaviour, using the results from Chapter 4 and 5.

Supporting our prediction, mindfulness induction reduced blast intensities across all provocation levels for depleted Indonesians to the same extent it affected their British counterparts. Thus regardless of the influences of culture in shaping individual's personality (discussed in the latter section), the current analysis revealed that the benefit of mindfulness induction on the reductions of aggressive behaviour under depleted self-control resources is likely to be similar across cultures.

Additionally, the main effect of mindfulness induction and depletion condition on direct aggression was also similar across cultures. Specifically, under no provocation and low provocation, depleted Indonesian and British participants delivered higher blast intensity in the adapted TCRT task than non-depleted ones, whereas those who received mindfulness induction delivered lower blast intensity than those who did not receive mindfulness induction. In Lawrence and Hutchinson's study (2013a; see also Anderson et al., 2008), participants who were asked to deal with an opponent that initially refrained from behaving aggressively showed less aggressive responses in subsequent provocation procedure, compared to participants with an initially aggressive opponent. As the levels of provocation increased, the impact of the opponent's initial behaviours became less significant.

In the same way, the *independent* role of mindfulness and depletion conditions across cultures may be less observable as people encounter more severe offences (i.e., no significant effect of each condition on participant's blast intensity under high provocation). Crucially, however, we found that the *joint* effect of mindfulness and depletion on participant's blast intensity persisted even following high provocation from the opponent. This highlights our conclusion that the cross-cultural benefit of mindfulness on aggressive behaviour would be salient when individual's self-control resource has been depleted, even when the experience of provocation is severe.

The moderation of mindfulness induction on the link between depletion and maximum blast latency was also equivalent for Indonesian and British participants. When participants' sex was accounted in the model, the impact of culture became significant. Even so, contrary to our prediction, the likelihood of delivering the

maximum aggressive responses decreased for British participants with mindfulness induction compared to their Indonesian counterparts. Although speculative, it is plausible that the novelty factor of mindfulness interventions may have produce an additional effect for the British, by delaying their maximum aggressive response while at the same time reducing their intensity of physical aggression (i.e., blast intensity levels). The UK has been described as a curious nation, with a low score on Hofstede et al.'s (2010) *uncertainty avoidance* dimension (i.e., the extent to which cultures seek to minimise feeling threatened by ambiguous or unknown situations).

For indirect aggression, the three-way interaction between mindfulness x depletion x culture was not significant. Given that similar results were obtained from the separate analyses of the British and Indonesian participants, it is likely that any potential effect that mindfulness may have on attenuating the impact of depletion is not observable on indirect aggression.

### 6.5.2 Cultural differences in the effect of mindfulness induction on self-control performance following depletion

In the two previous chapters, mindfulness induction moderated the link between depletion and self-control performance (handgrip stamina) prior to the TCRT-task for the Indonesians, but not for British participants. Collectivism cultural background has also been suggested as a possible moderator of ego-depletion (Baumeister, Vohs, et al., 2007; Balliet & Joreiman, 2010; Seeley & Gardner, 2003). However, the current analysis revealed that moderating effect of mindfulness on self-control performance following depletion was similar across cultures. Specifically, only those who received mindfulness induction and non-depleted participants showed a better self-control performance than their counterparts. This indicates that despite cultural differences, the positive independent effect of mindfulness induction and the negative effect of depletion condition affected self-control performance to the same extent.

### 6.5.3 Cultural differences in personality variables

In the current samples, none of the Indonesian participants and only one British participant reported having formal experience with mindfulness practices (defined as "a specific meditational practice in directing attention without making any judgment"). The Indonesian participants, however, scored higher on trait mindfulness compared to the British, suggesting that they might have been more engaged more with the application of mindfulness in daily life (Koentjaraningrat, 1985), without necessarily having experience of formal mindfulness interventions. This provided an empirical basis for our assumption that those in Indonesia may be more mindful.

As expected, both samples showed equal levels of trait self-control. Even so, the underlying reasons for this cross-cultural similarity would probably differ. The British sample may see self-controlled regulation as means to facilitate the achievement of personal goals (Brown et al., 2007a), whereas the Indonesian sample may be motivated to practice self-control because they want to comply with societal norm. Both reference values could enact as a standard for engaging in self-controlled regulation (Carver & Scheier, 1982, 2011; Baumeister, Schmeichel, et al., 2007).

While individuals from collectivistic cultures typically reported lower levels of behavioural component of aggression (e.g., Bergeron & Schneider, 2005; Forbes et al., 2009; Ramirez et al., 2001), a comparable level of self-reported physical aggression was found in our sample. The Indonesian participants scored significantly higher in other subscales of aggression (i.e., verbal aggression, anger, hostility). Their levels of sensitivity to frustrations (SF) were also higher, but they were equally sensitive to provocations (SP) with the British participants. Given that trait physical aggression has been demonstrated as the strongest predictor for direct aggression in the TCRT task (Giancola & Parrott, 2008), and that SP typically predicted provoked aggression (Lawrence, 2013b; also our results from Study 2), our result implies that the Indonesian sample may be equally aggressive with the British in the TCRT task. As discussed in the next section, this was not the case in the current analysis, as the

Indonesian delivered significantly higher blast intensities in all provocation levels compared to the British sample.

Additionally, with regards to the potential link between aggression and self-harm, no significant culture or sex differences between self-harmers and non self-harmers were shown in the current analysis. Tresno et al.'s (2012) study in university students in Indonesia also found a comparable rate of self-harm across sexes, and a similar rate to Gratz's (2001) developmental study of the Deliberate Self-Harm Inventory (DSHI) in the US. This indicates that self-harm may also be a widespread problem in developing countries, with similar rates as in developed countries.

### 6.5.4 Cultural differences in aggressive behaviour

Despite the comparable effectiveness of mindfulness induction on direct aggression following depletion, a different pattern of direct aggression was shown across cultures. Specifically, compared to the British sample, the Indonesian sample delivered significantly higher blast intensities under provocation and at baseline level. Several mechanisms may have come into play.

In the TCRT task, the Indonesian participants might have simply complied with the instruction to win the task, and were paying less attention to the disguised provocation procedure (i.e., the noise blasts they received following each losing trial). As a result, they might spontaneously deliver blast levels at any random point. However, if this explanation holds, it is unclear why the standard deviation of the Indonesians blast intensity was similar to the British (see Table 6.4).

More plausible is that the Indonesian may be less sensitive to the provocation procedure in the TCRT task. This possibility may be related to the absence of correlation between the Indonesian participants' responses and levels of provocation from the opponent (section 5.4.5.1, Chapter 5). Provocation has been described as the major antecedent of aggression (Berkowitz, 1993; Geen, 2001), and

severe provocations typically generate more approval than unprovoked aggression across cultures (Ramirez, 2007). Naturally, cultural differences would be smaller as the level of provocations increased. While this would suggest that the Indonesians may have lack of sensitivity to provocations, comparable scores were shown between samples in trait SP. Thus the lack of provocation sensitivity of the Indonesians seems to be specifically related to the TCRT method of provocation, rather than to provocations in general. We did, however, found a typical sex differences in both cultures, in which males delivered higher intensity blasts under conditions of no and low provocation during the TCRT as opposed to females (see Giancola & Parrott, 2008; Lawrence & Hutchinson, 2013a, 2013b).

We could not dismiss the second possibility that the Indonesian sample is, in fact, more physically aggressive than the British, at least in the context of laboratory aggression procedure that did not involve any apparent damage consequences. Due to the increased fear of social evaluation when being observed acting out aggressively, the Indonesian sample may only reduce aggression when seen. In the TCRT task, aggressive behaviour is not directly observed. Relatedly, the Indonesians might feel it is appropriate to chastise aggressive behaviour from the opponent in the TCRT by delivering blasts as a punishment for aggressive behaviour. Higher blast intensity of the Indonesians as opposed to the British was consistent when males and females were analysed separately.

On the other hand, males in both cultures waited longer before delivering the maximum blast as opposed to females. Giancola and Parrott (2008) posit that shock intensity is a more explicit and blunt form of aggression, whereas shock *duration* is more implicit, subtle, and less amenable to influences of social desirability and impression management. The seemingly ambiguous nature of the latency measure is arguably similar to shock duration, and thus perceived as more suitable measure for female aggression than for male aggression across cultures due to its less overt aspect.

The rating of indirect aggression for the Indonesians was equal to the British. This runs counter the argument that conflict-avoidant values of collectivistic societies may lead to greater indirect aggression (French et al., 2002), or the finding elsewhere (Forbes et al., 2009) that decreases in individualism are associated with decreases in both direct and indirect aggression. Examination on the specific indirect aggression ratings revealed that even though Indonesians rated the opponent as being more aggressive, they also rated the opponent as more fair and less competitive. No significant culture or sex differences were found in rating of the opponent's skill or in the willingness to play with the same opponent again. The inconclusive pattern of results in ratings of indirect aggression suggests that cultural differences in aggression may be manifested into direct rather than indirect aggression, at least in the current samples.

### 6.5.5 Cultural differences in self-control performance

Finally, we found that culture and participants' sex played an important role on self-control performance. Specifically, the Indonesians showed a better self-control performance than the British prior to the TCRT task. This pattern (Indonesians outperformed British), however, was particularly pronounced for males, whereas no cultural differences were found in female's ability to perform self-control task. Gender role in self-control literature is commonly studied in a specific context of delinquent and criminal behaviours (see e.g., Gibson, Ward, Wright, Beaver & Delisi, 2010). In contrast, ego-depletion studies have not typically investigated sex differences in self-control performance (Hagger et al., 2010). In the current samples, it is unlikely that sex differences in handgrip stamina were associated with trait self-control (measured by Tangney et al.'s SCS, 2004), as reflected by the almost equal self-control scores between sexes across cultures (*M* females = 3.13, *SD* = .47 vs. *M* males = 3.06, *SD* = .55). Thus other factors may be more viable for this finding. For instance, females were more able to maintain their baseline handgrip stamina than males possibly because they are typically more compliant from an early age

(Kochanska, Coy & Murray, 2001), and our result implies that this tendency may be similar across cultures.

Sex differences in self-control performance could also stemmed from a shift in motivation (see Inzlicht & Schmeichel's "process" model of depletion, 2012), or other mediating variables that were not investigated in the current analysis, such as subjective fatigue, perceived difficulty, or self-efficacy (Hagger et al., 2010). As observed in both of our experiments, most participants considered the handgrip task as a measure of physical strength. While furnishing baseline handgrip duration, male participants tend to push themselves to hold the handgrip as long as they can, while female participants tend to show less confident of their ability to perform the task. On the subsequent measures of handgrip stamina, males showed more pressure to compete with their own baseline duration, while females expressed more confidence (as reflected in a typical comment, "This is much easier than what I thought."). Future work could fruitfully explore whether culture and sex differences would emerge on other types of self-control task.

### 6.5.6 Strengths and limitations of the current analysis

The current analysis provided a statistical comparison of the strength of the benefit of mindfulness induction in counteracting the effect of depletion on aggressive behaviour and self-control performance across cultures. Cross-cultural comparison of the personality measures in mindfulness, self-control, aggression, and self-harm derived from Western operationalisation was also performed.

Apart from the argument that mindfulness should be more applicable in Indonesia given its origin in Eastern contemplative traditions, our central theoretical construct was the cultural differences in individualism vs. collectivism. We used the individualism vs. collectivism distinction based on the characteristics of general population, and did not measure these dimensions directly. Our sample consists of university students, who are subjected to the influences of modernisation. For the

Indonesians, these influences may include a shift from traditional collectivism to contemporary individualism, resulting in smaller cross-cultural differences than they would be in the general population. Direct measures of cultural values should be included in future cross-cultural study to test this possibility. Exploration of the role of other constructs, such as religion, is also necessary, since religion may provide a more comprehensive understanding on aggressive behaviour across cultures (Ramirez, 2007).

Another limitation is that we did not operationalise the native British into their culture groups (e.g., British Anglo-Saxons and British Asians). While our practice appears to be common in cross-cultural work, intracultural differences are indeed possible. Previous study (Thanzami & Archer, 2005) comparing British Anglo-Saxons and British Asians from the Indian subcontinent suggested that those two samples differed in their cultural orientation, although their belief about aggression was not derived from a person's cultural orientation. A future study could include measure of beliefs about aggression in addition to direct measure of cultural values.

### 6.5.7 Conclusions

The current analyses revealed that mindfulness induction was effective at reducing physical aggression and sustaining self-control performance under depleted self-control resources across culture. Our findings also suggest that Eastern conceptualisation of the constructs of mindfulness, self-control, aggression, and self-harm may be related to the Western. It should be noted, however, that the employment of the adapted TCRT task *as a method of provocation* might be less effective in non-Western population, particularly in Indonesia. Even so, the TCRT task appears to be effective as a means to demonstrate aggression that varies as a function of sex, and is reduced via mindfulness interventions. The sensitivity of this task in the Indonesians to pick up on differential provocation is less clear.

# CHAPTER SEVEN

## Summary and general discussion

In this chapter, we will reintroduce the original research questions, and then the summaries of each study will be presented with particular focus as to how they address the original research questions. The contribution of this thesis to the literature on mindfulness, self-control, and aggression will be detailed, and the limitations of the thesis and avenues for further research will be presented.

## 7.1. SUMMARY

### 7.1.1 Summary of each study

The primary question addressed by the thesis was: "What is the effect of mindfulness on aggression?" Additionally, we investigated the potential role of self-control on the potential link between mindfulness and aggression. In particular, the thesis aimed to (i) examine the extent to which the benefits of mindfulness on aggression may occur outside extensive training in mindfulness, (ii) directly compare the benefits of mindfulness and self-control on aggression, (iii) assess the validation of Western operationalisation of mindfulness, and self-control, on aggression, and (iv) investigate any similarities between the mechanisms of aggression and self-harm regarding mindfulness and self-control and individual differences.

In Study 1 (Chapter 2), we explored the relationship between self-reported measures of mindfulness, self-control, and aggression (both to the self and to others). Data from 241 participants (211 university students, 30 non-students) showed that individuals who were more mindful and more self-controlled reported being less aggressive typically. The influence that trait mindfulness had on general trait aggression, as well as on physical aggression, anger, and hostility was mediated by trait self-control. After accounting for self-control, mindfulness still predicted significant variance in overall trait aggression, and anger, and hostility in particular,

but not in physical aggression. Mindfulness also decreased the likelihood of anger amongst individuals who were more sensitive to provocations (SP), and of hostility amongst those who were more sensitive to frustrations (SF). Additionally, mindfulness and self-control reduced individuals' tendency to harm themselves (self-harm) in the same way as mindfulness and self control reduced aggression to others. However, as in trait physical aggression, less self-harming behaviour occurred primarily in those high in trait self-controlled regulation.

To examine the effect of mindfulness and self-control on *aggressive behaviour*, we conducted three experimental studies. In these studies, aggressive behaviour was provoked using the adapted Taylor Competitive Reaction Time (TCRT: Taylor, 1967) task, in which participants were (i) exposed to no provocation, low provocation, and high provocation trials from a bogus opponent, and (ii) given opportunity to deliver or to *not* deliver a noise blast to the opponent in each winning trial. Participants' aggressive behaviour was measured in terms of (i) blast intensity delivered to the bogus opponent (as a main measure of direct physical aggression), (ii) maximum blast latency (the number of trials participants waited before delivering the maximum blast to the opponent, as an additional measure of direct aggression), and (iii) indirect aggression (anonymous post TCRT reputation damage of the opponent). In a validity study of the Taylor paradigm, Giancola and Parrott (2008) have recommended shock or blast duration rather than blast intensity alone as a more implicit measure of aggression. In addition, we also measured the impact of mindfulness and self-control on self-control performance (i.e., handgrip task).

Study 2 (Chapter 3) employed a brief 10-min mindfulness walking exercise (mindfulness induction vs. relaxation) and a 2-week training of improving posture (self-control training vs. no training). Results from 99 (51 females) university students showed that self-control training decreased blast intensity in response to provocation. Reductions in provoked aggression were also predicted by lower levels of trait SP. For female participants only, mindfulness induction predicted the delayed delivery of maximum noise blasts to the opponent. These findings suggest that under conditions of full self-control resources, self-control training increases people's capacity to resist from behaving aggressively (explicit aggression) when being

provoked. By contrast, mindfulness induction may be more reliable as a means to reduce more subtle/implicit forms of aggression. While no complementary effect of mindfulness and self-control exercises was found on aggressive behaviour, a crossover interaction was shown on self-control performance (handgrip power). Specifically, a better handgrip power was shown by those who received one condition only (mindfulness induction or self-control training), but not by those who received either both conditions or no condition. Interestingly, while trait aggression and self-control were negatively related to self-harm in Study 1, Study 2 did not show any relationship between either aggressive behaviour or self-control performance and self-harm status.

In Study 2, all participants were operating under full self-control resource capacity. Here, mindfulness had no clear influence on the intensity of aggression exhibited, although the mindfulness indication has some influence on more implicit measures of aggression (the delay duration before the maximum aggressive response was delivered). In Study 3, the impact of mindfulness on resource-depleted participants was examined. A different type of mindfulness induction was used (i.e., a 15-min of mindfulness breathing exercise), and the results from 110 (58 females) native British students revealed that mindfulness induction counteracted the effect of depletion on blast intensity under no provocation and low provocation trials in the TCRT task, but not under high provocations from the opponent. Individuals higher in trait SP also delivered higher levels of blast intensity under low provocation trials. However, contrary to our prediction, mindfulness induction *increased* the likelihood of delivering the maximum blast earlier for depleted female participants. The positive effect of mindfulness induction on self-control performance (assessed by changes in handgrip duration relative to baseline) was independent of depletion condition.

Study 4 (Chapter 5) was a cross-cultural replication of Study 3. This study examined the aggressive behaviour of 119 (60 females) Indonesian students recruited from a university in Indonesia. Replicating the findings from Study 3, mindfulness induction significantly moderated the link between ego-depletion and blast intensity on low provocation trials. The moderation effect of mindfulness was also shown under high provocation trials, but not in the absence of provocation. Interestingly, unlike in

Study 2 and 3, individual differences in SP did not predict blast intensity following provocation. Mindfulness induction also *decreased* the likelihood of delivering the maximum blast earlier for depleted Indonesian females. When measured before the TCRT task, the positive effect of mindfulness induction on self-control performance was shown in particular for depleted participants.

Data from the British and the Indonesian samples were statistically compared in Chapter 6. The comparison showed that mindfulness induction reduced blast intensities for depleted Indonesians to the same extent it affected their British counterparts under all provocation trials. With the inclusion of participants' sex, mindfulness induction decreased the likelihood of delivering the maximum blast earlier for depleted British participants compared to their Indonesian counterparts, and for males as opposed to females. Thus in the context where individuals lack of self-control resources, the role of mindfulness in reducing direct physical aggression appears to be similar across cultures, whereas its effect in a subtle/implicit form of aggression may be more evident for British participants, and for female than for male aggression across cultures. Mindfulness and depletion conditions independently influenced self-control performance (handgrip stamina) across cultures. Additionally, the Indonesian sample delivered significantly higher blast intensities across all provocation levels but also showed a better self-control performance than the British sample, whereas no cultural differences were found on the maximum blast latency, indirect aggression, or self-harm status.

### 7.1.2 Summary of findings

The thesis has examined the specific mechanisms through which mindfulness and self-control may influence the production of aggressive/non-aggressive behaviour. Trait mindfulness appears to play a unique role on reducing individual's levels of anger and hostility, whereas reductions in trait physical aggression and self-harm may be more associated with self-control mechanisms (Study 1). Under depleted self-control resource, mindfulness induction reduced direct physical aggression (Studies 3 and 4). This effect was replicated across cultures (Chapter 6). Under full

resources of self-control, mindfulness induction only reduced the subtle/implicit form of aggression (maximum blast latency for females), whereas self-control training reduced direct aggression following provocation (Study 2). The effect mindfulness induction on self-control performance (handgrip task), however, was less predictable by the mechanism of self-control.

Neither mindfulness induction or self-control training (Study 2) nor mindfulness induction or depletion (Study 3 and 4) influenced indirect aggression (anonymous reputation damage to the opponent). Further, individual differences in SP predicted provoked aggression (Study 2 and 3), except in the Indonesian samples (see Study 4). Even though all studies reported that trait mindfulness and self-control were mostly correlated to self-reported measures of aggression and self-harm, trait mindfulness and self-control had no significant influence on the link between experimentally activated mindfulness, self-control, and aggressive behaviour across the experimental studies. The implications of these findings will be detailed in the following section.

## 7.2. GENERAL DISCUSSION

### 7.2.1 Mindfulness, self-control, and aggression

As introduced in Chapter 1, mindfulness-based interventions have recently been implemented for treatment of aggression in mental health and forensic settings (see e.g., Howells, 2010; Howells et al., 2010; Shonin et al., in press). However, whether and when the potential benefits of mindfulness can be separated from a general mechanism of self-control are yet unclear, particularly in the context of extensive training in mindfulness (Masicampo & Baumeister, 2007). Throughout this thesis, we conducted a series of correlational and experimental studies to investigate the role of mindfulness and self-control on aggression, based on the strength model of self-control framework proposed by Baumeister and colleagues (1994, 2007). In this way, it would be possible to examine whether the effect of mindfulness on aggression

may occur outside extensive training in mindfulness, while at the same time directly compare the effect of mindfulness and self-control on aggression.

Resembling past research (e.g., Barnes et al., 2007; Borders et al., 2010; Brown & Ryan, 2003; Kelly & Lambert, 2012), individual differences in mindfulness were shown to be associated to lower propensity to aggress (Study 1). This association was mediated by trait self-control, confirming the suggestion elsewhere (Borders et al., 2010; Heppner et al., 2008) for the underlying mechanism of mindfulness in the reductions of aggression. Importantly, we found that the presence of a mindful quality uniquely reduced the experiences of anger and hostility, independent of one's dispositional ability in self-control. Even though the experience of anger is typically short-lived (e.g., Averill, 1983; Tyson, 1998), it may produce a cognitive residual of hostility (Buss & Perry, 1992). Moreover, ruminating on anger provoking experiences may increase aggressive behaviour, even towards innocent others (Bushman, 2002; Bushman et al., 2005). Our result implies that the capacity to be aware of these experiences, with no direct attempt to control them, may decrease the intensity of and increase the tolerance to these experiences, and thereby reduces the preparedness to behave aggressively.

It should be noted, however, that presence of a mindful quality showed no additional reduction in the overt component of aggression (i.e., trait physical aggression) beyond the general ability to exert self-control (Study 1). Compared to other components of the general trait aggression (i.e., verbal aggression, anger, hostility: Buss & Perry, 1992), trait physical aggression has been demonstrated as the strongest predictor of direct aggression in terms of shock intensities in the TCRT task (Giancola & Parrott, 2008). Thus it is crucial to clarify whether the comparable benefits of dispositional mindfulness and self-control on physical aggression would be mirrored by experimentally activating levels of mindfulness and self-control.

The strength model of self-control has provided two two experimental pathways for examining the role of self-control on aggressive behaviour, by (i) bolstering self-control capacity (e.g., via self-control training and acute glucose consumption), and (ii) weakening or depleting self-control capacity (Denson et al., 2012; DeWall et al.,

2011). In this thesis, their proposal was elaborated by including mindfulness. Accordingly, we found that brief laboratory induction of state of mindfulness reduced the production of direct physical aggression when individuals' self-control resource has been depleted (Studies 3 and 4). A similar effect was shown across cultures (Chapter 6), indicating the efficacy of Western operationalisations of mindfulness, self-control, and aggression in non-Western contexts.

In the absence of depletion (under full resources of self-control), the effect of state mindfulness on aggressive behaviour was less salient (Study 2). That is, state mindfulness only reduced the production of a subtle/implicit form of aggression (the delay duration before the maximum aggressive response was delivered). In contrast, training in self-control was effective in reducing direct physical aggression following provocation (Study 2). This latter finding replicates the results from past studies employing different types of self-control training, such as using nondominant hand in mundane tasks (Denson et al., 2011) and verbal regulation of avoiding colloquialisms (Finkel et al., 2009). Supporting the strength model proposal, the benefit of self-control training on the reductions of aggression does not depend on the type of self-control task being practiced, providing the practice requires the individuals to alter their habitual responses (see e.g., Baumeister et al, 2006).

The notable divergence of the benefits of mindfulness induction under depleted and full self-control resources requires further elaboration. Depletion may lead to an impulsive, aggressive action in particular when the urge to aggress is high, such as after being provoked (DeWall et al., 2011; Denson et al., 2012). In our studies, depleted participants were shown to deliver higher blast intensities than non-depleted ones after the experience of provocation across cultures (Study 3 and 4). The cultivation of mindfulness serves a monitoring function to momentary ("in-the-moment") experience (e.g., Bishop et al., 2004; Brown et al., 2007a; Shapiro et al., 2006). This may facilitate sustaining attention on the task at hand rather than shifting motivation and attention from exerting control to acting on aggressive impulses (see Inzlicht & Schmeichel's "process" model of depletion, 2012). As expected, the presence of state of mindfulness reliably counteracted the effect of depletion on provoked aggression (Study 3 and 4). Under full self-control resource,

however, increases in self-control strength can be used effectively as a chief resource to alter expressed aggression in response to provocation (Study 2).

It is also noteworthy that indirect aggression (anonymous reputation damage to the opponent) was not influenced by mindfulness induction or self-control training (Study 2), or by mindfulness induction or depletion (Study 3 and 4). Thus any potential effect that mindfulness and self-control has on aggressive behaviour may be less observable on indirect aggression.

Inconclusive pattern of results was obtained on the effect of mindfulness and self-control on self-control performance (i.e., handgrip task). Mindfulness induction did counteract the effect of depletion when self-control performance was measured before the TCRT task (Study 4), but its positive effect after the TCRT was independent of depletion condition (Study 3 and 4) and was even detrimental amongst those who have performed training in self-control (Study 2). These findings suggest that when individuals are required to perform a subsequent self-control act after they have engaged in a provocation procedure, the complementary effect of mindfulness and self-control is less marked, and may even reverse. Continuously sustaining attention on the task at hand may be especially difficult for novice meditator (Holzel et al., 2011; Sauer et al., 2013), and this effect seems to be more pronounced after the experience of provocation.

Relatedly, the lack of participants' formal experience with mindfulness meditation might have contributed to absent of significant correlation between trait mindfulness and self-control with experimentally activated mindfulness, self-control, and aggressive behaviour across the experimental studies. As shown elsewhere (e.g., Carmody, Reed, Kristeller, & Merriam, 2008; Thompson & Waltz, 2007), at least amongst individuals naive to meditation, state mindfulness during formal sitting meditation was less related to their propensity to be mindfulness. A threshold level of mindfulness may be required in order for novice meditators to show the ability to be mindful during mindfulness induction.

### 7.2.2 Cultural differences in sensitivity to provocation and aggressive triggers

Cultures play a major role on the articulation of aggression and self-controlled acts. Nevertheless, the benefit of mindfulness induction in attenuating the negative impact of depletion on aggressive behaviour appears to be similar across cultures (Chapter 6). The Indonesian sample (Study 4) reported very similar levels of sensitivity to provocation (SP) to that within the British sample (Study 3). This indicates that the Indonesian sample were no more sensitive to signals of provocations than the British sample, despite hypothesised differences in the tolerance of aggression as a means to facilitate the achievement of individual goals (Forbes et al., 2009; Hofstede et al., 2010; Li et al., 2010).

According to Lawrence and colleagues, aggressive behaviour as a result of provocation might be more accurately predicted by individual differences in SP than by trait aggression alone (Lawrence & Hutchinson, 2013b; Lawrence & Hodgins, 2009). They also suggested that provocations and frustrations are not interchangeable triggers of aggressive behaviour (Lawrence, 2006; Lawrence & Hutchinson, 2013a). As predicted, we found that provoked aggression in the TCRT task was affected by SP, such that individuals with higher levels of SP delivered higher blast intensity to the opponent when they were being provoked, but not in the absence of provocation (Study 2 and 3). Although individuals who reported higher SP also reported higher levels of sensitivity to frustration (SF) and a greater propensity to aggress, aggressive behaviour was neither predicted by SF nor by trait aggression (Study 1 to 4). These findings provide further validation of the SP scale, in addition to that shown by Lawrence and Hodgkins (2009) and Lawrence and Hutchinson (2013b). In the Indonesian sample, however, the lack of significant correlation between SP and provoked aggression may provide a challenge to the applicability of the TCRT procedure in non-Western cultures.

With regards to the TCRT task, the Indonesian sample demonstrated the typical sex differences associated with levels of provocation (i.e., males being more aggressive than females under no provocation and low provocation, but not under high provocation trials; see Bettencourt & Miller's meta-analytic review, 2006). The usual

association between participants' blast intensity and levels of provocation from the opponent (e.g., Anderson et al., 2008; DeWall et al., 2010; Konrath et al., 2006; Lawrence & Hutchinson, 2013a, 2013b; also our results in Study 2 and 3) was not shown. Given that the validity of the Taylor paradigm as a measure of direct physical aggression has been provided in Western countries (e.g., Giancola & Parrott, 2008), it is plausible that the TCRT task might not influence aggression in the Indonesian sample in the same way as has been shown in Western samples.

One way in which this difference in response to the TCRT task between British and Indonesian samples might occur is due to the anticipation of social sanctions. As pointed out by Lawrence and Hutchinson (2013b), the fact that the participants never anticipate to meet their opponent in the TCRT task rarely occurs in real life. In Evers et al.'s (2005) study, although anger provoking event (i.e., negative feedback from a partner) increased the anger experience in male participants to the same extent with in females, similarities in the anger expressions (i.e., the amount of hot sauce allocated to the partner) were found only when participants did not expect to meet the partner. Under a situation when they expected to meet the partner, females expressed less anger than males. In the same way, the Indonesian people, who commonly presumed that anger expression and direct aggression as a sign of lack of self-control and inner strength (Koentjaraningrat, 1985; Magnis-Suseno, 1997), may only inhibit aggression expressions when the negative social implications of these expressions are made salient. Relatedly, the implicit endorsement of the participants' aggressive responding in the TCRT task by an authority figure (i.e., the experimenter; see Ritter & Elsea, 2005; Tedeschi & Quigley, 1996) might also be particularly relevant for people from collectivist cultures.

Collectivist individuals should be more motivated to engage in self-control on daily basis (Balliet & Joireman, 2010; Eisenberg & Zhou, 2000; Seeley & Gardner, 2003), thus higher levels of self-control and less aggression should be expected. However, repeated practice of self-control should be interspersed with rest (see Hagger et al., 2010). If display of aggression is always frowned on, there is a possibility that people might not develop the ability to moderate their aggression across situations as much. Instead, their constant attempts to exert self-control over aggressive impulses

may produce a chronic state of ego-depletion. As recognised by Baumeister et al. (2007b), "there are levels of depletion beyond which people may be unable to control themselves effectively, regardless of what is at stake" (p.353). Altogether, the lack of anticipated negative implications from the opponent, permission from the authoritative figure, and a chronic state of depletion might have cause higher display of aggressive behaviour in the Indonesian sample across all levels of provocation from the opponent; and so decreasing the efficacy of the TCRT task.

### 7.2.3 Mindfulness, self-control, and self-harm

An additional aim of this thesis was to examine any similarities between the mechanisms of aggression and self-harm, regarding mindfulness and self-control as well as individual differences. A comparable rate of self-harm was shown across cultures (Chapter 6). Individuals who self-harmed (having engaged in self-harming behaviour more than five times: Gratz & Chapman, 2007) also reported greater propensity to harm others (Studies 1, 2, and 4), supporting the positive association between self-harm and aggression that has been outlined elsewhere using different set of predictors (e.g., Barbui et al., 2009; Hillbrand, 2001; Placidi et al., 2001).

It has also been suggested that the risk assessment of self-harm as an emotional regulation strategy should account for both self-control-related (i.e., ability to engage in goal-directed behaviours and to inhibit impulsive behaviour) and mindfulness-related components (i.e., the capacity to increase the awareness of and acceptance of negative emotions: Gratz, 2007; Gratz & Roemer, 2004). Of the few reported studies that investigated the role of both mindfulness and self-control components in one sample, Slee, Spinhoven, et al. (2008) found a stronger mediating role of self-control on the link between a brief Cognitive Behaviour Therapy (CBT) and self-harm, but a much weaker mindfulness mediation. In this thesis, we also found that while self-harming individuals tend to be less mindful and less self-controlled (Study 1 and 2), declines in self-harming behaviour occurred primarily through self-controlled regulation (Study 1).

In the experimental studies, we did not experimentally test self-harming behaviour. Instead, we used individuals' self-reported information regarding their propensity to self-harm as a predictor for the role of mindfulness and self-control on aggressive behaviour. Contrary to prediction, we found that self-harm status was neither related to direct nor indirect aggression (Studies 2, 3, and 4). This implies that the TCRT task may have not triggered sufficient emotional distress for self-harmers to engage in aggressive responding. Self-harmers seem to posses more vulnerability to frustrating or stressful events (Nock, 2009). These types of events may increase the intensity and frequency of negative experiences. Individuals may then engage in self-harming or aggressive behaviour to break the vicious cycle between these emotions and rumination (Roberton et al., 2012; Selby et al., 2008, in press). Indeed, increased rumination has been shown to predict increases in suicidality in a number of cross-sectional, case-control and longitudinal studies (see Morrison & R. C. O'Connor's systematic review, 2008). It is unlikely that the TCRT task could engender intense experiences which activate the link between rumination, self-harm, and aggression.

## 7.3 LIMITATIONS AND IMPLICATIONS FOR FUTURE RESEARCH

### 7.3.1 Sample characteristics

The experimental studies (Study 2, 3, and 4) in this thesis consisted of entirely university students, thus limiting the generalisability of the findings. Results from Study 1 (section 2.4.1, Chapter 2) indicated that non-students (12.40% of the total participants) were higher in both trait mindfulness and self-control than student participants (all significant at $p < .0001$). In the Mindfulness-Based Stress Reduction (MBSR), individuals higher in trait mindfulness were shown to benefit more that those with lower baseline levels (Shapiro, Brown, Thoresen, & Plante, 2011). A similar effect might imply for those higher in trait self-control, as the complexity of mindfulness interventions would require a high degree of self-control (for a review, see Baer, 2003). On the other hand, a review on the benefits of laboratory-based studies of mindfulness suggests that the beneficial effects of mindfulness may be more noticeable amongst clinical populations than amongst healthy subjects (see

Keng et al., 2011). Either way, future work needs to examine whether a differential effect of mindfulness induction on aggression would occur on diverse samples.

The experimental studies failed to recruit the optimum number of participants as calculated by G*Power 3 (2013). With reference to the previous similar study (Friese et al., 2012), however, the sample size in the cross-cultural studies (Study 3 and 4) was sufficient. We also recruited an equal number of males and females in the experimental studies to account for the possible sex differences that are prevalent in studies using the TCRT tasks (see e.g., Anderson et al., 2008; Giancola & Parrott, 2008). To anticipate the issue with regards to this small sample size, a bootstrapping procedure based on 5,000 resamples (A. F. Hayes, 2011, 2012a) was performed on the data. Nevertheless, the effect of mindfulness induction on the link between depletion and aggressive behaviour, although significant and consistent across cultures, was considerably small in size ($R^2$ increased due to the interaction was around 3.29 to 3.79%, $p < .05$).

### 7.3.2 Brief laboratory mindfulness induction

Different types of mindfulness induction and control condition were employed in the experimental studies. In Study 2, we used mindfulness walking exercise (Kabat-Zinn, 1994; Sujiva, 2000) and Progressive Muscle Relaxation (PMR: Jacobson, 1938) for the control condition. In Study 3 and 4, we used mindfulness of breathing exercise (Williams & Pennman, 2011) and a neutral educational information (e.g., Erisman & Roemer, 2010). Thus it is plausible that the noticeable differential outcome across these studies may be due to the lack of similarities of the mindfulness conditions.

As concluded in Keng et al.'s review (2011), a standard protocol for the mindfulness instruction and control group in laboratory studies of mindfulness has not been established; and only a limited number of these studies have explicitly assessed the level of state mindfulness. The mindfulness of walking exercise is a novel technique in laboratory settings, although it has been integrated in clinical training of mindfulness (Centre for Mindfulness, 1995; Oxford Mindfulness Centre, 2002). The

relaxation exercise was given in Study 2 to limit the possibility that relaxation alone could account for the impacts of mindfulness induction (Baer, 2003). A-1 month or longer training in mindfulness was reported to produce additional effects over relaxation training in terms of reducing distractive and ruminative thoughts and behaviours (Jain et al., 2007) and reducing the emotional interference from unpleasant stimuli (Ortner et al., 2007). In Study 2, no differences in participant's level of state mindfulness (TMS: Lau et al., 2006) were reported following a brief period of mindfulness walking and relaxation exercises (i.e., 10 min). Moreover, both exercises had no influence on participant's blast intensity, although only mindfulness induction predicted delayed delivery of the maximum blast. Exploring the point at which the differential effect of mindfulness and relaxation could be observed, as well as the comparability of various mindfulness exercises is indeed crucial.

In Study 3 and 4, we used one of the most common methods of laboratory inductions of mindfulness (i.e., mindfulness of breathing; see e.g., Arch & Craske, 2006; Broderick, 2005; Feldman et al., 2010). As the relaxation procedure might arguably be a very conservative control group, a neutral educational information was given as control condition. A similar control condition has been employed in past mindfulness, aggression, and ego-depletion studies. In Friese et al.'s (2012) ego-depletion study with participants from a 3-day mindfulness meditation seminar, non-mindfulness induction participants were asked to complete a neutral task (i.e., six connect-the-dots figures forming mundane objects). In Heppner et al.'s (2008) aggression study, control participants simply waited for approximately the same time as the induction condition.

Future research could employ different types control condition, such as *passive* progressive muscle relaxation (in which participants are instructed to relax muscle groups without tensing) and loving-kindness meditation (a type of meditation that focuses on feelings of warmth and care for oneself and others). One study comparing three 15-min exercise in mindfulness of breathing, passive progressive muscle relaxation, and loving-kindness meditation found that only mindfulness meditation increased decentering (as assessed by Lau et al.'s TMS, 2006) and reduced the association between frequency of repetitive thought and negative

reactions to thoughts (Feldman et al., 2010). Alternatively, various emotion regulation strategies, such as cognitive reappraisal, distraction, unfocused attention, or worry (see Keng et al., 2011) could also be employed. These latter conditions were not employed in Study 3 and 4 because regulating emotions might cause participants' to spend their self-control resources (Baumeister, Vohs et al., 2007), which may lead to an additional depleting effect.

### 7.3.3 Self-control task

A number of well-established self-control tasks were employed in this thesis. Self-control performance was measured using a handgrip task (Study 2, 3, and 4; see Hagger et al.'s meta-analysis, 2010). An attention control task was given as an ego-depleting condition (Study 3 and 4; see DeWall et al., 2007; Finkel et al., 2009) and an improving posture exercise was used as self-control training (Study 2; see e.g., Muraven et al., 1999). Despite the variety of these tasks, all imposed the necessity for participants to exert self-control over their habitual responses, and were reported to be successful in manipulating participants' level of self-control in terms of the extent to which participants have to control their attention (Study 3 and 4) and adherence to the training (Study 2).

In Study 3 and 4, a 6-min period was chosen for the attention control task to induce depleting effect. As noted by Hagger et al. (2010), the task duration in ego-depletion studies typically lasted for less than 10 min, and the relationship between duration of depleting task and impairment in self-control performance is only marginally significant. Thus within the range of 10 min, spending a longer time on a depleting task may not consume more of the self-control resource.

In Study 2, we aimed to compare the benefit of increased levels of mindfulness and self-control on aggressive behaviour. Clearly we have to use longer than 10 min duration in order to produce a positive effect of self-control exercise. However, we have no a priori reference as to how long it would take for people to recover from the depletion effect. Provided the limitation of self-control resource (Baumeister et

al., 1994; Baumeister, Vohs, et al., 2007), continuously practicing self-control without sufficient amount of time to recover may be chronically depleting. Future work should attempt to determine at what point practicing self-control task would stop being ego-depleting and start becoming a strengthening of the self-control resource, or even producing a chronic state of depletion.

On the other hand, practicing self-control acts for two weeks, presumably interspersed with rest, appear to be sufficient to increase self-control strength (see Baumeister et al., 2006). Therefore, in Study 2 we employed this standard duration for self-control training, and compare its effect on aggressive behaviour to the effect of a-10 min mindfulness induction. The incompatibility in time duration between these treatments might have reduced the expected moderation effect of mindfulness on the link between self-control training and aggression. Also, during the 2-week interim period, non self-control training participants were not required to perform any additional activities and were not contacted as much as the training participants. Keeping an equal involvement between groups, as well as asking the no training group to perform tasks that do not require self-control, such as solving math problems or keeping a diary of the self-control acts they engage in (Muraven, 2010) is noteworthy during the interim period.

In addition, our result also indicates the importance of self-controlled regulation on the reductions of self-harm (Study 1). Future studies could fruitfully explore the effect of self-control in daily activities (e.g., tracking eating habit, using nondominant hand in a mundane task; see Baumeister et al., 2006) on self-harming behaviour.

### 7.3.4 Aggressive triggers

In this thesis, a loud noise blast was employed as a trigger for aggressive responding due to the close resemblance between this trigger and physical provocation in real life. We also provided three alternative ways to assess aggression in the TCRT task: blast intensity, maximum blast latency, indirect aggression. The relevance of alternative ways of assessing aggression other than blast intensity has been

suggested elsewhere (Giancola & Parrott, 2008). Yet, the efficacy of the TCRT task appears to be limited in terms of its ability to (i) activate and differentiate between levels of provoked aggression in the non-Western sample (Study 4), and (ii) activate the link between individual differences in self-harm and aggressive behaviour.

Given the importance of social appraisal in collectivist societies (Hofstede et al., 2010; Triandis, 1995), cross-cultural study employing the TCRT task could include manipulation of participants' expectations about whether or not they will meet the opponent. Alternatively, providing participants with verbal insult from the experimenter might also be particularly effective in collectivist samples. In this way, the role of anticipated social sanctions for the expressions of aggression could be activated. We did not include insult manipulation in the Indonesian sample for comparability with previous findings in the literature and within the thesis.

Laboratory measures of self-harming behaviour, such as the Self-aggression Paradigm (SAP) developed by Berman and colleagues (Berman & Walley, 2003; McCloskey & Berman, 2003) could also be incorporated in future studies. The SAP is based on the TCRT task, in which participants are provided the opportunity to self-administer electric shocks each time they lose a trial. In that sense, self-harm may also function as a mechanism for self-punishment (Gratz, 2003). A positive link has been shown between shock intensity in the SAP and self-reported self-aggressive ideation (Berman & Walley, 2003; Berman, Jones, & McCloskey, 2005) and clinician ratings of suicidal and self-harming history (McCloskey & Berman, 2003). Replication of the SAP and the TCRT task in a single study (providing option to blast both the opponent and oneself) could help explain whether losing a competition would create a sufficient stress for self-harmers to aggress against themselves and others.

Other validated laboratory procedure of aggression could also be applied, with the aforementioned adjustments when tested across cultures and amongst self-harmers. For instance, in the Point Subtraction Aggression Paradigm (Cherek, 1981; see also Golomb, Cortez-Perez, Jaworski, Mednick, & Dimsdale, 2007), participants are asked to play an economic game which involves pressing a particular button to earn a sum of money or to deduct the same sum from an opponent. In the hot sauce paradigm

(Lieberman, Solomon, Greenberg, & McGregor, 1999), participants are required to determine the amount of hot sauce to a provoking agent known to dislike spicy foods. As in the Taylor paradigm, behaviour towards the partner is assumed to reflect an immediate intent to cause harm through direct physical aggression.

### 7.3.5 Self-reported measures

All the self-reported measures used this thesis have been widely used validated, particularly in Western countries (see section 2.3.3, Chapter 2). Cultural equivalency in terms of sensitivity to provocations (SP), but not in sensitivity to frustrations (SF) was shown in the Situational Triggers of Aggressive Responses (STAR: Lawrence, 2006) scale (Chapter 6). As SP did not predict aggressive behaviour in the TCRT task for the Indonesian sample (Study 4), further studies may incorporate the STAR scale to test whether this measure can reliably predict aggressive behaviour triggered by different methods of provocation and frustration outside a Western context. A similar suggestion also implies for other translated measures used in this thesis, the Mindfulness Attention Awareness Scale (MAAS: Brown & Ryan, 2003), the Self-Control Scale (SCS: Tangney et al., 2004), the Aggression Questionnaires (AQ: Buss & Perry, 1992), the Deliberate Self-Harm Inventory (DSHI: Gratz, 2001), the Toronto Mindfulness Scale (TMS: Lau et al., 2006), and the Positive Affect, Negative Affect Schedule (PANAS: Watson et al., 1988), as we did not perform any additional testing on the psychometric properties of these measures. The SCS in particular, appears to include only self-controlled behaviour in serve of personal goals (see Appendix 2.1), thus might be culturally bias when applied to collectivist individuals that are expected to exert control as means of compliance with societal norms.

Information on participants' self-harming behaviour in this thesis (as measured by the DSHI) was limited to direct destruction of body tissue in the *absence* of suicidal intent. The National Collaborating Centre for Mental Health (2012) has recently suggested that the distinction of self-harming behaviour based on the presence/absence of suicidal intent is unnecessary because the underlying motivation of this behaviour is often unclear (see also Kapur et al., 2013). It is

plausible that a stronger pattern of association between self-harm and aggressive *behaviour* would have been obtained if we include measures of self-harm in the *presence* of suicidal intent. More severe symptoms of psychopathology and psychosocial impairment have been shown by individuals with a history of both non-suicidal self-harm and suicidal behaviour compared to those who engaged only in self-harm in the absence of suicidal intent (see Hamza et al., 2012).

### 7.3.6 Future directions

The availability or temporary deficit in the self-control "resource" has been typically measured *indirectly*, either from individuals' post-depletion performance on self-control tasks or on aggression tasks (see Hagger et al., 2010). As a result, the extent to which mindfulness may replenish the self-control resource was also measured indirectly throughout this thesis. Future studies should identify the underlying emotional, cognitive, and biological processes that might come into play on the association between mindfulness, self-control, and aggression.

According to the General Aggression Model (GAM: Anderson & Bushman, 2002), aggressive behavior may be affected by genetic and other biological factors through the influences of these factors on learning, decision-making, arousal, and affective processes. For instance, testosterone in both males and females has been historically linked to increases in physical aggression and mood, particularly following social provocations (for a systematic review, see Archer, 1991; also Neave & D. B. O'Connor's recommendation, 2009, on experimentally elevated testosterone levels). The link between testosterone and aggression was found to be mediated by reduced activation in the brain regions associated with impulse control and self-regulation (Mehta & Beer, 2010). Thus while this line of research has not been reported, it is reasonable to expect that increases capacity to self-regulate due to mindfulness interventions may influence the link between testosterone, self-control, and aggression.

On the other hand, people's plans, expectations, and goals may also influence aggressive behaviour by influencing their appraisal and decision processes (Anderson & Bushman, 2002). Thus one way through which aggression could be reduced is by realising that there are (negative) potential consequences for behaving aggressively. More expressed aggression was found amongst individuals who focus on the immediate benefits and ignore the future consequences of their behaviour (Bushman, Giancola, Parrot, & Roth, 2012; Joireman, Anderson, & Strathman, 2003). These individuals also showed lower level of trait self-control (as measured by Tangney et al.'s SCS, 2004) as well as greater susceptibility to ego-depletion effect (Joireman, Balliet, Sprott, Spangenberg, & Shultz, 2008). As such, self-controlled individuals may act less aggressively due to their strong concern about the future.

Conversely, mindfulness sustains people's attention back to the present experience rather than to the future or the past. Therefore, it is important to know what aspect of the "here and now" mindfulness is focusing people on to reduce aggression. Mindfulness may decrease aggression because it stops people from ruminating towards aggression-triggering events in the past (Borders et al., 2010). However, it is unclear whether keeping attention in the here and now would also mean stop worrying about the negative consequences of aggression, which could increase aggressive responses. Some reversed-items measure in the MAAS (Brown & Ryan, 2003; see appendix 2.1.) might appear to contradict people's concern for the future (e.g., "I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there"). Measures of individual differences in rumination (e.g., Ruminative Response Scale [RRS]: Nolen-Hoeksema & Morrow, 1990) and anticipation of the future consequences (Consideration of Future Consequences [CFC]: Strathman, Gleicher, Boninger, & Edwards, 1994) could be included to anticipate where the interaction might be taking place.

Conversely, another way though which aggression could be reduced is by changing one's perspective about events in the past. Participants who were asked to reflect on a provoking event from a "fly on the wall" ("self-distanced") perspective, as opposed to from a first-person ("self-immersed") perspective reported fewer aggressive thoughts and angry feelings, and displayed less aggressive behaviour (Mischkowski,

Kross, & Bushman, 2012). Self-distancing has also been proposed as a core element that reduces the association between anger and rumination in Denson's (2013) multiple system model of angry rumination.

Self-distancing involves a shift in the *content* of people's thought about their past, in a sense that past experience is being *reconstrued* to promote insight and closure rather than being *recounted* based on details of the experience (for a review, see Kross & Ayduk, 2011). Arguably, self-distancing may qualify as a self-controlled regulation because its aim is to change the self in order to avoid some undesirable states (with regards to the past). It may also be related to mindfulness because both involve a fundamental shift in one's perspective (Kross, Gard, Deldin, Clifton, & Ayduk, 2012). In mindfulness mode of awareness, however, no attempt is made to change the content of consciousness based on self-reflection (Brown et al., 2007b; Brown & Ryan, 2003). So any thinking that one does about the past is simply being observed, without making direct effort to detach from the associated emotional content. Future research could compare the benefit of practicing self-distancing, mindfulness, and self-control on aggressive behaviour.

**Concluding remarks**

This thesis has been the first to replicate that the immediate benefits of mindfulness on aggression can be measured outside extensive training in mindfulness. Only one reported aggression study (Heppner et al., 2008) actively manipulated participants' state of mindfulness. The thesis represents an important and original extension by (i) directly comparing the effect of mindfulness and self-control training on aggressive behaviour, (ii) investigating the role of mindfulness as one potential mechanism to reduce aggression following self-control depletion, (iii) exploring whether the effect of mindfulness on aggressive behaviour would differ for different levels of provocation and different forms of aggression, (iii) including behavioural measure of self-control performance as additional outcome, (iv) employing cross-cultural samples, and (v) investigating any similarities between the mechanisms of aggression and self-harm regarding mindfulness and self-control and individual differences.

At this point, it can be suggested that mindfulness induction is effective at reducing physical aggression under ego-depleted condition, where individuals are “in particular need for an efficient handling of mental resources” (Friese et al., 2012, p.5). Since the conceptualisation of mindfulness, self-control, and aggression was derived from Western operationalisations of these concepts, the findings also suggest that the influences of these Western constructs may operate effectively in non-Western settings. Information from this thesis may be useful for the implementation of mindfulness and self-control for treatments of aggression and self-harm across cultures.

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## APPENDICES

### Appendix 2.1.

*Trait measures for Study 1 to 4*

*(All trait measures were presented online. The same following instruction was used except for the Hospital Anxiety and Depression [HADS]: Zigmond & Snaith, 1983 and the Deliberate Self-Harm Inventory [DSHI]: Gratz, 2001.):* This survey asks you a little about yourself. Please indicate how much each of the following statements reflects how you typically are. Everyone feels differently about this so there are no right or wrong answers, we are interested in your opinions. Do not spend too long on any one statement.

**Mindful Attention Awareness Scale (MAAS: Brown & Ryan, 2003)**

| **How frequently or infrequently you currently have each experience?** | **Almost Always** | **Very Frequently** | **Somewhat Frequently** | **Somewhat Infrequently** | **Very Infrequently** | **Almost Never** |
|---|---|---|---|---|---|---|
| 1. I could be experiencing some emotion and not be conscious of it until some time later. | | | | | | |
| 2. I break or spill things because of carelessness, not paying attention, or thinking of something else. | | | | | | |
| 3. I find it difficult to stay focused on what's happening in the present. | | | | | | |
| 4. I tend to walk quickly to get where I'm going without paying attention to what I experience along the way. | | | | | | |
| 5. I tend not to notice feelings of physical tension or discomfort until they really grab my attention. | | | | | | |
| 6. I forget a person's name almost as soon as I've been told it for the first time. | | | | | | |
| 7. It seems I am "running on automatic," without much awareness of what I'm doing. | | | | | | |

| How frequently or infrequently you currently have each experience? | Almost Always | Very Frequently | Somewhat Frequently | Somewhat Infrequently | Very Infrequently | Almost Never |
|---|---|---|---|---|---|---|
| 8. I rush through activities without being really attentive to them. | | | | | | |
| 9. I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there. | | | | | | |
| 10. I do jobs or tasks automatically, without being aware of what I'm doing. | | | | | | |
| 11. I find myself listening to someone with one ear, doing something else at the same time. | | | | | | |
| 12. I drive places on "automatic pilot" and then wonder why I went there. | | | | | | |
| 13. I find myself preoccupied with the future or the past. | | | | | | |
| 14. I find myself doing things without paying attention. | | | | | | |
| 15. I snack without being aware that I'm eating. | | | | | | |

**Brief Self-Control Scale (Brief SCS: Tangney et al., 2004)**

| How much each of the following statements reflects how you typically are? | Not at all | Moderately inaccurate | Neither inaccurate or accurate | Moderately accurate | Very much |
|---|---|---|---|---|---|
| 1. I am good at resisting temptation. | | | | | |
| 2. I have a hard time breaking bad habits. | | | | | |
| 3. I am lazy. | | | | | |
| 4. I say inappropriate things. | | | | | |
| 5. I do certain things that are bad for me, if they are fun. | | | | | |
| 6. I refuse things that are bad for me. | | | | | |
| 7. I wish I had more self-discipline. | | | | | |
| 8. People would say that I have iron self- discipline. | | | | | |

| How much each of the following statements reflects how you typically are? | Not at all | Moderately inaccurate | Neither inaccurate or accurate | Moderately accurate | Very much |
|---|---|---|---|---|---|
| 9. Pleasure and fun sometimes keep me from getting work done. | | | | | |
| 10. I have trouble concentrating. | | | | | |
| 11. I am able to work effectively toward long-term goals. | | | | | |
| 12. Sometimes I can't stop myself from doing something, even if I know it is wrong. | | | | | |
| 13. I often act without thinking through all the alternatives. | | | | | |

**Hospital Anxiety and Depression (HADS: Zigmond & Snaith, 1983)**

Read each item and place a firm tick in the box opposite the reply, which comes closest to how you have been feeling IN THE PAST WEEK.

1. I feel tense or wound up:
   - Most of the time ☐
   - A lot of the time ☐
   - Time to time, occasionally ☐
   - Not at all ☐

2. I still enjoy the things I used to enjoy:
   - Definitely as much ☐
   - Not quite so much ☐
   - Only a little ☐
   - Hardly at all ☐

3. I get a sort of frightened feeling as if something awful is about to happen:

8. I feel as if I am slowed down:
   - Nearly all the time ☐
   - Very often ☐
   - Sometimes ☐
   - Not at all ☐

9. I get a sort of frightened feeling like "butterflies" in the stomach:
   - Not at all ☐
   - Occasionally ☐
   - Quite often ☐
   - Very often ☐

10. I have lost interest in my appearance:

Very definitely and quite badly ☐
Yes, but not too badly ☐
A little, but it doesn't worry me ☐
Not at all ☐

4. 4 I can laugh and see the funny side of things:
As much as I always could ☐
Not quite so much now ☐
Definitely not so much now ☐
Not at all ☐

5. Worrying thoughts go through my mind:
A great deal of the time ☐
A lot of the time ☐
From time to time bur not too often ☐
Only occasionally ☐

6. I feel cheerful:
Not at all ☐
Not often ☐
Sometimes ☐
Most of the time ☐

7. I can sit at ease and feel relaxed:
Definitely ☐
Usually ☐
Not often ☐
Not at all ☐

Definitely ☐
I don't take so much care as I should ☐
I may not take quite as much care ☐
I take just as much care as ever ☐

11. I feel restless as if I have to be on the move:
Very much indeed ☐
Quite a lot ☐
Not very much ☐
Not at all ☐

12. I look forward with enjoyment to things:
As much as I ever did ☐
Rather less than I used to ☐
Definitely less than I used to ☐
Hardly at all ☐

13. I get sudden feelings of panic:
Very often indeed ☐
Quite often ☐
Not very often ☐
Not at all ☐

14. I can enjoy a good book or radio or TV programme:
Often ☐
Sometimes ☐
Not often ☐
Very seldom ☐

**Situational Triggers of Aggressive Responses (STAR: Lawrence, 2006)**

| How accurately each of the following situations makes you feel aggressive? | Very inaccurate | Moderately inaccurate | Neither inaccurate or accurate | Moderately accurate | Accurate |
|---|---|---|---|---|---|
| 1. A friend betrays me. | | | | | |
| 2. I am the subject of a practical joke. | | | | | |
| 3. People I live with show a lack of consideration. | | | | | |
| 4. Someone steals something from me. | | | | | |
| 5. I feel frustrated. | | | | | |
| 6. Someone insults me. | | | | | |
| 7. I have academic or work problems. | | | | | |
| 8. I experience family dispute. | | | | | |
| 9. I feel hot and crowded. | | | | | |
| 10. Someone ignores me. | | | | | |
| 11. Someone behaves in an inconsiderate manner towards me. | | | | | |
| 12. I am in pain. | | | | | |
| 13. I am goaded or provoked by someone. | | | | | |
| 14. I've been let down by someone. | | | | | |
| 15. I feel stressed. | | | | | |
| 16. Someone is drunk and behaves inconsiderately towards me. | | | | | |
| 17. I hear a noise that I cannot control. | | | | | |
| 18. I am frustrated with services. | | | | | |
| 19. Others around me are becoming aggressive. | | | | | |
| 20. Someone makes offensive remarks to me. | | | | | |
| 21. Another driver commits a traffic violation. | | | | | |
| 22. I argue with a friend. | | | | | |

**Aggression Questionnaire (AQ: Buss & Perry, 1992)**

| How accurately each of the following statements describes the way in which you act when you feel angry or aggressive? | | Very inaccurate | Moderately inaccurate | Neither inaccurate or accurate | Moderately accurate | Accurate |
|---|---|---|---|---|---|---|
| 1. | Occasionally I can't control the urge to strike someone. | | | | | |
| 2. | I tell my friends openly when I disagree with them. | | | | | |
| 3. | I flare up quickly but also get over it quickly. | | | | | |
| 4. | I am sometimes eaten up with jealousy. | | | | | |
| 5. | Given enough provocation I may hit another person. | | | | | |
| 6. | I often find myself disagreeing with people. | | | | | |
| 7. | When frustrated, I let my irritation show. | | | | | |
| 8. | At time I feel I have gotten a raw deal out of life. | | | | | |
| 9. | If somebody hits me, I hit back. | | | | | |
| 10. | When people annoy me, I may tell them what I think. | | | | | |
| 11. | I sometimes feel like I'm about to explode. | | | | | |
| 12. | Other people always seem to get the breaks. | | | | | |
| 13. | I get into fights a little more than the average person. | | | | | |
| 14. | I can't help getting into arguments when people disagree with me. | | | | | |
| 15. | I am an even-tempered person. | | | | | |
| 16. | I wonder why sometimes I feel so bitter about things. | | | | | |
| 17. | If I have to resort to violence to protect my rights then I will. | | | | | |
| 18. | My friends say that I'm somewhat argumentative. | | | | | |
| 19. | Some of my friends think I'm a hothead. | | | | | |
| 20. | I know that 'friends' talk about me behind my back. | | | | | |
| 21. | There are people who pushed me so far we came to blows. | | | | | |
| 22. | Sometimes I fly off the handle for no good reason. | | | | | |
| 23. | I am suspicious of overly friendly strangers. | | | | | |

| How accurately each of the following statements describes the way in which you act when you feel angry or aggressive? | Very inaccurate | Moderately inaccurate | Neither inaccurate or accurate | Moderately accurate | Accurate |
|---|---|---|---|---|---|
| 24. I can think of no good reason for ever hitting a person . | | | | | |
| 25. I have trouble controlling my temper. | | | | | |
| 26. I sometimes feel that people are laughing at me behind my back. | | | | | |
| 27. I have threatened people that I know. | | | | | |
| 28. When people are especially nice, I wonder what they want. | | | | | |
| 29. I have become so mad that I have broken things. | | | | | |

**Deliberate Self-Harm Inventory (DSHI: Gratz, 2001)**

This questionnaire asks about a number of different things that people sometimes do to hurt themselves. Please be sure to read each question carefully and respond honestly. Often, people who do these kinds of things to themselves keep it a secret, for a variety of reasons. However, honest responses to these questions will provide us with greater understanding and knowledge about these behaviours and the best way to help people.

Please answer YES to a question only if you did the behaviour INTENTIONALLY, or on purpose, to hurt yourself; without intending to kill yourself**. Do not respond yes if you did something accidentally** (e.g., tripped and banged you head by accident). If you answer yes, then please indicate the FREQUENCY of each behaviour.

| Have you ever intentionally (i.e., on purpose)… (without intending to kill yourself) | Indicate Yes or No | If Yes, how many times have you done this? | |
|---|---|---|---|
| | | Less than 5 times | More than 5 times |
| 1. Cut your wrist, arms, or other area(s) of your body? | Y / N | | |
| 2. Burned yourself with a cigarette? | Y / N | | |
| 3. Burned yourself with a lighter or a match? | Y / N | | |

| | Have you ever intentionally (i.e., on purpose)… (without intending to kill yourself) | Indicate Yes or No | If Yes, how many times have you done this? | |
|---|---|---|---|---|
| | | | Less than 5 times | More than 5 times |
| 4. | Carved words into your skin? | Y / N | | |
| 5. | Carved pictures, designs, or other marks into your skin? | Y / N | | |
| 6. | Severely scratched yourself, to the extent that scarring or bleeding occurred? | Y / N | | |
| 7. | Bit yourself, to the extent that you broke the skin? | Y / N | | |
| 8. | Rubbed sandpaper on your body? | Y / N | | |
| 9. | Dripped acid onto your skin? | Y / N | | |
| 10. | Used bleach, comet, or oven cleaner to scrub your skin? | Y / N | | |
| 11. | Stuck sharp objects such as needles, pins, staples, etc. into your skin, **not** including tattoos, ear piercing, needles used for drug use, or body piercing? | Y / N | | |
| 12. | Rubbed glass into your skin? | Y / N | | |
| 13. | Broken your own bones? | Y / N | | |
| 14. | Banged your head against something, to the extent that you caused a bruise to appear? | Y / N | | |
| 15. | Punched yourself, to the extent that you caused a bruise to appear? | Y / N | | |
| 16. | Prevented wounds from healing? | Y / N | | |
| 17. | Done anything else to hurt yourself that was not asked about in this questionnaire? If yes, what did you do to hurt yourself? ---------- ---------- ---------- | Y / N | | |

**Appendix 2.2.**

*Advertising materials for Study 1*

# ONLINE SURVEY PARTICIPANTS NEEDED

We are conducting an **ONLINE SURVEY** looking at the links between **psychological constructs** of mindfulness, self-control, aggression, and self-harm.

**NO RESTRICTIONS** for participating, you don't need to be experiencing any of the behaviours detailed above to take part.

You can **ACCESS THE STUDY DIRECTLY** through the link below:

**http://www.surveymonkey.com/s/KLYLXC6**

This should take you about 10-15mins. Instructions are given on the website. All information will be **CONFIDENTIAL**.

Optionally, by participating and providing an email address, you will be entered into **a £25 prize draw.**

Thank you,

Researcher : Cleo Yusainy
Supervisor : Dr. Claire Lawrence
School of Psychology, University of Nottingham
QUESTIONS? Please email me, lpxcy@nottingham.ac.uk, or call me on 07557199702.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| http://www.surveymonkey.com/s/KLYLXC6 | http://www.surveymonkey.com/s/KLYLXC6 | http://www.surveymonkey.com/s/KLYLXC6 | http://www.surveymonkey.com/s/KLYLXC6 | http://www.surveymonkey.com/s/KLYLXC6 | http://www.surveymonkey.com/s/KLYLXC6 | http://www.surveymonkey.com/s/KLYLXC6 | http://www.surveymonkey.com/s/KLYLXC6 | http://www.surveymonkey.com/s/KLYLXC6 | http://www.surveymonkey.com/s/KLYLXC6 | http://www.surveymonkey.com/s/KLYLXC6 |

## Appendix 2.3

*Information to participants for Study 1*

**ONLINE SURVEY ON MINDFULNESS, SELF-CONTROL, AGGRESSION, AND SELF-HARM**

*Researcher : Cleo Yusainy*
*Supervisor : Dr. Claire Lawrence*
*School of Psychology, University of Nottingham*

You are invited to take part in a survey on mindfulness, self-control, aggression, and self-harm. Before you decide, it is important for you to understand why the research is being done and what it will involve.

This study is not concerned with your actual levels of mindfulness, self-control, aggression, and self-harm – but we are interested in how these behaviours and propensities are associated with each other. You will be asked to carry out a set of questionnaires which should take about 15 minutes.

Please answer AS HONESTLY AS YOU CAN. All information obtained during the study will be CONFIDENTIAL. Any data which we collect will be ANONYMISED.

We really appreciate your help in participating in this study. If at any time you decide that you do not want to continue to take part in the study, you are FREE TO WITHDRAW by clicking the "Exit this survey" link at the top right corner of every page.

Optionally, by participating in this study and providing an email address you will be entered into a £25 PRIZE DRAW.

If you would like to discuss anything further, please email me – Cleo Yusainy at lpxcy@nottingham.ac.uk. . Alternatively you can call me on 07557199702 or find me in room B76 in the School of Psychology. You can also contact the supervisor of this study (Dr. Claire Lawrence) at Claire.Lawrence@nottingham.ac.uk.

**Appendix 2.4**

*Electronic consent form for Study 1 and Study 2 (Time 1)*

## Consent Form

Researcher : Cleo Yusainy
Supervisor : Dr. Claire Lawrence
School of Psychology, University of Nottingham

Please read the following statements:

- I have read and understood the participant information sheet

- I have had the opportunity to ask questions and discuss the study

- All my questions been answered satisfactorily

- I have received enough information about the study

- I understand that I am free to withdraw from the study:
at any time
without having to give a reason

"THIS STUDY HAS BEEN EXPLAINED TO ME TO MY SATISFACTION, AND I AGREE TO TAKE PART. I UNDERSTAND THAT I AM FREE TO WITHDRAW AT ANY TIME."

If all these statements apply to you please select the option below. If you require further information or have additional questions, please contact the Researcher (Cleo Yusainy) by email: lpxcy@nottingham.ac.uk or tel. 07557199702.

*By selecting this option,

◯ I AGREE TO TAKE PART IN THIS STUDY

◯ I DON'T AGREE

I have explained the study to the above participant and he/she has agreed to take part.

Signature of researcher: Cleo Yusainy
Date: 2011

## Appendix 2.5

*Debrief materials for Study 1*

**ONLINE SURVEY ON MINDFULNESS, SELF-CONTROL, AGGRESSION, AND SELF-HARM**

*Researcher : Cleo Yusainy*
*Supervisor : Dr. Claire Lawrence*
*School of Psychology, University of Nottingham*

Thank you for taking part in the study. All data will be kept confidential and used for research purposes only. By clicking the 'DONE' button below (and providing an email address) you are also entering a £25 prize draw.

If you have any questions about the issues covered in this study, feel free to contact the Researcher - Cleo Yusainy at lpxcy@nottingham.ac.uk or on 07557199702. You can also contact the supervisor of this study (Dr. Claire Lawrence) at Claire.Lawrence@nottingham.ac.uk.

USEFUL POINTS OF CONTACT

The following points of contact will also be able to provide you with any information you need:

Cripps Health Centre (Nottingham students' and staff health centre): 0115 950 1654

Nightline (University of Nottingham): Offers support, practical advice and information to anyone concerned about mental distress as well as practical information. Tel: 0115 951 4985 http://www.su.nottingham.ac.uk/organisation/NottinghamNightline/
(also available for non-university participants). Open daily 7pm – 8am.

University of Nottingham Counselling Service: 0115 951 3695

Mind Info Line: Information on all aspects of mental distress. 0845 766 0163—9am to 5pm, Monday to Friday. http://www.mind.org.uk

Samaritans: Free emotional support to anyone going through a crisis. 08457 90 90 90—24 hours a day, 7 days a week. http://www.samaritans.org.uk

Harmless: Nottingham based self-harm support group. http://www.harmless.org.uk

## Appendix 3.1

*State measures for Study 2, 3, and 4*

**Positive Affect, Negative Affect Schedule (PANAS: Watson et al., 1988)**

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. **Indicate to what extent you feel this way right now, that is, at the present moment.**

Use the following scale to record your answers.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Very slightly or not at all | A little | Moderately | Quite a bit | Extremely |

| | | | |
|---|---|---|---|
| _____ | interested | _____ | irritable |
| _____ | distressed | _____ | alert |
| _____ | excited | _____ | ashamed |
| _____ | upset | _____ | inspired |
| _____ | strong | _____ | nervous |
| _____ | guilty | _____ | determined |
| _____ | scared | _____ | attentive |
| _____ | hostile | _____ | jittery |
| _____ | enthusiastic | _____ | active |
| _____ | proud | _____ | afraid |

**Toronto Mindfulness Scale (TMS: Lau et al., 2006)**

| | How well does the statement describe what you just experienced, just now? | Not at all | A little | Moderately | Quite a bit | Very much |
|---|---|---|---|---|---|---|
| 1. | I experienced myself as separate from my changing thoughts and feelings. | | | | | |
| 2. | I was more concerned with being open to my experiences than controlling or changing them. | | | | | |
| 3. | I was curious about what I might learn about myself by taking notice of how I react to certain thoughts, feelings or sensations. | | | | | |
| 4. | I experienced my thoughts more as events in my mind than as a necessarily accurate reflection of the way things 'really' are. | | | | | |
| 5. | I was curious to see what my mind was up to from moment to moment. | | | | | |
| 6. | I was curious about each of the thoughts and feelings that I was having. | | | | | |
| 7. | I was receptive to observing unpleasant thoughts and feelings without interfering with them. | | | | | |
| 8. | I was more invested in just watching my experiences as they arose, than in figuring out what they could mean. | | | | | |
| 9. | I approached each experience by trying to accept it, no matter whether it was pleasant or unpleasant. | | | | | |
| 10. | I remained curious about the nature of each experience as it arose. | | | | | |
| 11. | I was aware of my thoughts and feelings without overidentifying with them. | | | | | |
| 12. | I was curious about my reactions to things. | | | | | |
| 13. | I was curious about what I might learn about myself by just taking notice of what my attention gets drawn to. | | | | | |

**Appendix 3.2**

*Daily remainder for self-control group in Study 2*

Hi there,

I hope you are well. This is day-n of your improving posture exercise. To gain the benefit of an improved posture, it is crucial that you follow this direction and exert as much control as possible.

To help you track a record on the progress of your exercise, please indicate as honestly as possible **how frequently (on scale 1-6) you comply with the instruction of maintaining good posture (e.g., sit up straight, walk erectly, etc.)** at all time today.

1 = Almost Never
2 = Very Infrequently
3 = Somewhat Infrequently
4 = Somewhat Frequently
5 = Very Frequently
6 = Almost Always

You can do this by:

a. Simply replying this email by writing down your compliance on scale 1 to 6, or alternatively:
b. Downloading the 'Improving Posture Diary' document (attached) and filling out your compliance score on today's column only. If you prefer this option, you would only need to download this document once. Please keep it in a convenient place for you to fill it in every evening for two-week period.

To help you keep the track on your progress, we will send you a daily reminder about the exercise again tomorrow.

If you would like to discuss anything further, please email me – Cleo Yusainy lpxcy@nottingham.ac.uk. Alternatively you can call me on 07557199702 or find me in room B76 in the School of Psychology. You can also contact the supervisor of this study (Dr. Claire Lawrence) at claire.lawrence@nottingham.ac.uk.

We really appreciate your help in participating in our study. Participation is totally voluntary. All data collected will be kept confidential.

Kind regards,
Cleo Yusainy

## Appendix 3.3

*Mindfulness instruction for Study 2*

**Mindfulness walking exercise (Kabat-Zinn, 1994; Sujiva, 2000)**

The first task that you need to do today is called a mindfulness exercise. Mindfulness means fully experiencing what is happening in and around at this very moment. To facilitate this state of mindfulness, you will be asked to do a mindfulness walking exercise. This involves intentionally attending to the experience of walking itself; in other words it means simply walking and knowing that you are walking. Mindfulness walking is similar to normal walking, only more deliberate, relax, and slower—but not too slowly that you cannot feel any sensations. To help you make sense of this exercise, I will present you a video demonstration first. (VIDEO)

Before you do this exercise, there are some points that you need to bear in mind:

- Since the primary purpose of the mindfulness walking is to help you become aware of the present moment, you need to say every mental note silently while you are doing it, not before or afterwards.
- Your attention should be directed towards witnessing the full experience of walking (the movements, shifts of weight and balance, and sensations in the feet and legs associated with walking), as opposed to the physical feet per se. If you begin to notice your mind wandering, mentally take a note of whatever emotions, thoughts, feelings etc. arise. There is no need to avoid these emotions or to become occupied with them, simply observe what is happening. If however your mind gets too distracted, you may stop walking. Notice how these distractions would eventually pass away; gently bring your attention back to the intention of walking, then continue to walk again.
- There is no right or wrong in this exercise. You may do this with your shoes on, or you make take them off if this would help you feel more comfortable.

Now you will be guided to do this exercise as the narrator says the mental notes aloud for the first time. Then you will be asked to continue the processes on your own until you are instructed to stop.

1. Begin by standing, your hands in front of your body, one hand clasping the other. Look straight ahead or toward the floor several feet in front of you.
2. Observe the standing posture first. As you do, say in your mind "standing, standing". Remember that you need to say each mental note while you are doing it, not before or afterwards.
3. Next, note the intention to move. Then lift the right foot and place it down, then the left foot. Say in your mind "placing, placing" as you move, not before or afterwards.
4. On the last step, place your feet together, noting "stopping."
5. Observe the standing posture again. "Standing ".
6. Now you will begin to turn. The turn has four steps. Say in your mind "intending to turn."
7. Lift the toes of your right foot and pivot on your heel. Lift the left foot and place it down, the left foot doesn't pivot, but steps. Say in your mind "turning, turning" as you turn, not before or afterwards.
8. Finally note “Intending to walk”, and continue walking.
9. Follow the movement with your mind, don’t look at your feet.
10. If your mind gets too distracted, you may stop walking. Notice how these distractions would pass away. Then bring your attention back to the walking.
11. Now you may stop walking. Stand still and give yourself a few moments to comprehend what you have just experienced before you call the researcher.

## Appendix 3.4

*Relaxation instruction for Study 2*

**Progressive Muscle Relaxation (PMR: Jacobson, 1938)**

The first task that we will have you do today is called a progressive muscle relaxation. Progressive muscle relaxation is an exercise that will help you relax your mind and body by progressively tensing and relaxing muscle groups throughout your entire body. You will tense each muscle group vigorously, but without straining, and then suddenly release the tension and feel the muscle relax. To help you make sense of this exercise, I will present you a video demonstration first. (VIDEO)

Before you do this exercise, there are some points that you need to bear in mind:

- You will tense each muscle for about 5 seconds. If you have any pain or discomfort in any of the targeted muscle groups feel free to omit that step. Throughout this exercise you may visualize the muscles tensing and a wave of relaxation flowing over them as you release that tension.
- Allow your attention to focus only on your body. If you begin to notice your mind wandering, bring it back to the muscle you are working on. It is important that you keep breathing throughout the exercise.
- There is no right or wrong in this exercise. You may do this with your shoes on, or you make take them off if this would help you feel more comfortable.

Now you will be guided to do this exercise as the narrator says the mental notes. Then you will be asked to continue the processes on your own until you are instructed to stop.

1. Let's start by finding a comfortable sitting position in your chair, with both feet planted on the floor and your hands resting loosely in your lap. You can close your eyes if to deepen the relaxation you feel comfortable doing so.
2. Now take a few slow deep breaths. Draw the air all away to the bottom of your lungs so that you feel your abdomen expand with each inhalation.
3. Allow your body to relax with each breath and try to give yourself permission to leave all your worries behind for the next several minutes. Simply focus on your body.
4. As you continue your slow deep breathing, shift your focus to your feet. Curl your toes under tightly, tightly, and hold that tension… and then release that tension all at once, and let your feet go limp. Pay attention to the tingling sensation as the tension flows out of your feet.
5. Now press your knees together hard and hold that tension, hold it, hold it… and now release, and feel the relaxation spreads through your legs.
6. Take a moment to enjoy the warm sensation, and return your attention to your slow deep breathing.
7. Now tighten your thighs and buttocks by pressing your heels downwards firmly to the floor, hold this, hold this … and then relax. Feel your relaxation deepened, as the tension drains from your body, and your body grows heavier in your chair.
8. Now breath in deeply and a fill up your lungs completely. Hold your breath, experience that tension in your chest … now exhale, and let your chest relax. Continue breathing, letting your breath come freely and gently. Imagine the tension draining from your body with each exhalation.
9. Now shrug your shoulders up as if they could touch your ears, hold that tension, tighter, tighter … and release. Feel the relaxation spread through your neck and shoulders, melting away any tension that was there.

10. Now bend your elbows and tense your biceps as hard as you can, tense it … and release. Feel the tension being replaced by warmth and relaxation.
11. Clench your fists and notice the tension in your fists and forearms … Now relax and drop your hands back into your lap.
12. Now open your hands wide and stretch your fingers outwards, stretch, stretch … and release. Feel the looseness and warmth in your hands.
13. Return your attention to your breath. Breathe slowly and deeply, releasing tension as you exhale.
14. Now shift your attention to your face. Scrunch up your entire face. Pull your eyebrows into a frown, squeeze your eyes shut, clinch your jaw, pucker your lips, hold that, hold that … now release. Notice the relaxation melt the tension in your face.
15. Continue to breathe slowly and deeply.
16. Scan your body from your toes all the way up to your head. Notice areas that still hold some tension. Return your attention to those area, and tense, and relax once again.
17. Now take a few moments to just feel the warmth, heaviness, and comfort of your relaxed body.
18. When you are ready to end your relaxation, gently begin to wiggle your toes and fingers, give your body a slow gentle stretch before you stand up and call the researcher.

## Appendix 3.5

*Advertising materials for Study 2*

**Participants needed in a Reaction-Time Competition (Two-part study)**

Hi there,

You are invited to take part in a study investigating the effects of personality traits and experimental treatments on the way people perform in a competitive reaction-time task. If you consent to participate in this study, you will be asked to take part in 2 (TWO) TIMES POINT.

At the first part of the study, you will be asked to complete an ONLINE SURVEY (which will take only 10 minutes). By completing this part of the study, you will be entered into a £25 prize draw.

Based on random allocation, you may or may not be asked to perform a simple daily exercise of maintaining a good posture on your own for two weeks.

At the second part of the study, you will be asked to play an hour COMPUTER-BASED COMPETITIVE REACTION-TIME against an opponent in a laboratory in the School of Psychology (University Park). By participating in this part, you will be given an inconvenience allowance of £5*. In addition, a prize of £25 will also be given for fastest reaction time across all participants.

Participation in this study is totally voluntary. All data collected will be kept confidential and used for research purposes only.

If you are interested to participate, please email me, - Cleo Yusainy at lpxcy@nottingham.ac.uk, with the information about your sex (Male / Female) for administration procedure.

Thank you,
*Researcher : Cleo Yusainy*
*Supervisor : Dr. Claire Lawrence*
*School of Psychology, University of Nottingham*

* Alternatively, experimental credits will be given for participants signing up via the Research Participation Scheme (RPS).

## Appendix 3.6

*Information to participants for Study 2 (Time 1)*

**INFORMATION TO PARTICIPANTS REACTION-TIME COMPETITION**

*Researcher : Cleo Yusainy*
*Supervisor : Dr. Claire Lawrence*
*School of Psychology, University of Nottingham*

You are invited to take part in a study looking at PERFORMANCE IN A COMPETITIVE REACTION-TIME GAME. If you consent to participate in this study, you will be asked to take part in 2 TIMES POINT.

THIS IS PART 1 OF THE STUDY. Questions will be asked about your traits mindfulness, self-control, aggression, and self-harm. Completing this survey should take you about 10 MINUTES. By completing this part, you will be entered into a £25 prize draw.

(*Instruction in this paragraph was given to self-control training group only.)* Afterwards you will be asked to perform a simple daily exercise of maintaining good posture on your own for a two-week period; and to record your progress in a one-question diary questionnaire each evening. The purpose of this exercise is to help you improve your posture.

Next, you will be emailed a reminder about Part 2, an hour competitive reaction-time game in a laboratory in the School of Psychology (University Park). By participating in Part 2, you will be given an inconvenience allowance of £5*. In addition, a prize of £25 will also be given for fastest reaction time across all participants.

Your lack of continuation in Part 2 will not affect your entry into the incentive prize draw. Please note that all payment will be given after Part 2 is completed.

If at any time you decide that you do not want to continue, you are free to withdraw. All data collected will be kept confidential and used for research purposes only.

If you would like to discuss anything further, please email me – Cleo Yusainy at lpxcy@nottingham.ac.uk. Alternatively you can contact me on 07557199702 or find me in room B76 in the School of Psychology. You can also contact the supervisor of this study (Dr. Claire Lawrence) at claire.lawrence@nottingham.ac.uk.

*Experimental credits will be given for participants signing up via the Research Participation Scheme (RPS).

**Appendix 3.7**
*Debrief materials for Study 2 (Time 1)*

**DEBRIEF MATERIALS REACTION-TIME COMPETITION**

*Researcher : Cleo Yusainy*
*Supervisor : Dr. Claire Lawrence*
*School of Psychology, University of Nottingham*

Thank you very much for taking part in Part 1 of the study. This survey is not concern with the actual levels of your traits of mindfulness, self-control, aggression and self-harm, but with how these behaviours and propensities are associated with each other. The email address you provided will be entered into a £25 prize draw.

(*Instruction in this paragraph was given to self-control training group only.)* Next, we will email you about your following task, a simple daily exercise to improve your posture (e.g., sit up straight, walk erectly, etc.) on your own for two weeks period. Daily reminders will be sent via email so that your progress can be reported in a ONE-QUESTION QUESTIONNAIRE each evening.

Then you will be emailed about Part 2, a competitive reaction-time game, so that you can set up a convenient time to come to a laboratory in the School of Psychology (University Park). By participating in Part 2, you will be given an inconvenience allowance of £5*. In addition, a prize of £25 will also be given for fastest reaction time across all participants.

If at any time you decide that you do not want to continue, you are free to withdraw. All data collected will be kept confidential and used for research purposes only. Please note that all payment will be given after Part 2 is completed. However your lack of participation in Part 2 will not affect your entry into the incentive prize draw from Part 1.

If you would like to discuss anything further, please email me – Cleo Yusainy at lpxcy@nottingham.ac.uk. Alternatively you can contact me on 07557199702 or find me in room B76 in the School of Psychology. You can also contact the supervisor of this study (Dr. Claire Lawrence) at claire.lawrence@nottingham.ac.uk.

*Experimental credits will be given for participants signing up via the Research Participation Scheme (RPS).

## Appendix 3.8

*Information to participants for Study 2 (Time 2), and Study 3 and 4*

**INFORMATION TO PARTICIPANTS REACTION-TIME COMPETITION**

*Researcher : Cleo Yusainy*
*Supervisor : Dr. Claire Lawrence*
*School of Psychology, University of Nottingham*

You are invited to take part in a study investigating people performance in a reaction-time competition.

In the competition, you will be playing reaction-time task against a participant located in a different room. Your job is to RESPOND AS FAST AS YOU CAN to the stimuli presented on the computer screen. Each time you win a trial, you have the option to deliver a brief (50 ms) noise blast to your opponent. If you lose, your opponent will be given this opportunity. The noise blasts you will hear will always be at a clinically safe limit, but if you have any hearing problems you should let me know immediately and you will not be asked to continue.

Apart from the competition, you will be asked to complete a short survey on traits mindfulness, self-control, aggression, and self–harm; and to perform some simple unrelated tasks.

We really appreciate your help in participating in this study. If at any time you decide that you do not want to continue to take part, you are free to withdraw. All data collected will be kept confidential and used for research purposes only. Your name or any identifying characteristics will not be available to anyone other than the researcher, at any point.

By completing this study, you will be given an inconvenience allowance of £5*. In addition, a prize of £50 will also be given for fastest reaction time across all participants.

*Experimental credits will be given for participants signing up via the Research Participation Scheme (RPS).

**Appendix 3.9**

*Consent form for Study 2 (Time 2), and Study 3 and 4*

**CONSENT FORM REACTION-TIME COMPETITION**

*Researcher : Cleo Yusainy*
*Supervisor : Dr. Claire Lawrence*
*School of Psychology, University of Nottingham*

The participant should complete the whole of this sheet himself/herself. Please cross out as necessary:

| | |
|---|---|
| Have you read and understood the participant information sheet | YES/NO |
| Have you had the opportunity to ask questions and discuss the study | YES/NO |
| Have all the questions been answered satisfactorily | YES/NO |
| Have you received enough information about the study | YES/NO |
| Do you understand that you are free to withdraw from the study: | |
| at any time | YES/NO |
| without having to give a reason | YES/NO |
| Do you agree to take part in the study | YES/NO |

**"This study has been explained to me to my satisfaction, and I agree to take part.**
**I understand that I am free to withdraw at any time."**

Signature of the Participant : Date:
Name (in block capitals) :
Age :

I have explained the study to the above participant and he/she has agreed to take part.
Signature of researcher : Date:
Cleo Yusainy

**Appendix 3.10**

*Debrief materials for Study 2 (Time 2), and Study 3 and 4*

**DEBRIEF MATERIALS REACTION-TIME COMPETITION**

*Researcher : Cleo Yusainy*
*Supervisor : Dr. Claire Lawrence*
*School of Psychology, University of Nottingham*

Thank you for taking part of this study. The aim of this study is to investigate the effects of certain personality traits and experimental treatments on the way people perform in a reaction-time competition.

In the competition, you were in a condition which meant that you were actually competing against the computer. The level of noise that the computer gave to you was manipulated prior to the study. Please refrain from telling any possible future participants about the nature of this study, as they may be in a different condition to the one you did.

By completing this part of the study, you will be given an inconvenience allowance of £5*. In addition, a prize of £50 will also be given for fastest reaction time across all.

Your email and data will never be kept in the same place – and so cannot be matched up by anyone other than the researcher. Your responses are totally confidential and are used for research purposes only.

If you would like to discuss anything further, please email me – Cleo Yusainy at lpxcy@nottingham.ac.uk. Alternatively you can contact me on 07557199702 or find me in room B76 in the School of Psychology. You can also contact the supervisor of this study (Dr. Claire Lawrence) at claire.lawrence@nottingham.ac.uk.

## Appendix 4.1

*Mindfulness instruction for Study 3 and 4*

**Mindfulness of breathing exercise (Williams & Penman, 2011)**

For the next several minutes, you will be guided with an audio instruction to perform a simple exercise to induce a particular kind of awareness, called mindfulness of breathing. Mindfulness is paying attention in the present moment, with openness and curiosity, instead of judgment. We often focus on things other than what is happening in the moment—worrying about the future, thinking about the past, focusing on what is coming next, rather than what is right in front of us.

Sometimes we do pay close attention to what we are thinking and feeling, and we become very critical of our thoughts and feelings, and we try to either change them, or distract ourselves because this critical awareness can be very painful.

Being mindful falls between these two extremes—we pay attention to what is happening inside and around us, we see events and experiences as what they are, and we allow things we can't control to be as they are, while we focus our attention on the task at hand.

Mindfulness is a process: We do not reach a final and total state of mindfulness. It is a way of being in one moment that comes and goes.

The best way to understand mindfulness is to practice it, so let's do that now.

1. Settle into a comfortable sitting position, allow your back to adopt an erect, dignified posture; neither stiff nor tensed up, but comfortable. If sitting on a chair, have your feet flat on the floor with your legs uncrossed. Allow your eyes to close if that feels comfortable. If not, lower your gaze so it falls, unfocused, a few feet in front of you.
2. Bring your awareness to physical sensations by focusing your attention on the sensations of touch in the body where it is in contact with the floor and with whatever you are sitting on. Spend a few moments exploring these sensations.
3. Now focusing your attention on your feet, starting with the toes, expand the "spotlight of attention" so it takes in the soles of your feet, the heels and the top of your feet, until you are attending to any and all of the physical sensations you become aware of in both feet, moment by moment. Spend a few moments attending to the feet in this way, noticing how sensations arise and dissolve in awareness. If there are no sensations in this region of the body, simply register a blank. This is perfectly fine–you are not trying to make sensations happen–you are simply registering what is already here.
4. Now, expand your attention to take in the rest of both legs for a few moments, then the torso (from the pelvis and hips up to the shoulders); then the left arm; then the right arm; then the neck and head.
5. Spend a minute or two resting in the awareness of the whole body. See if it is possible to allow your body and its sensations to be just as you find them.
6. Now bring your awareness to the breath as it moves in and out of the body at the abdomen. Notice the changing patterns of physical sensations in this region of the body as the breath moves in and out. It may help to place your hand here for a few breaths, and feel the abdomen rising and falling.
7. You may notice mild sensations of stretching as the abdomen gently rises with each in-breath, and different sensations as the abdomen falls with each out-breath.
8. As best you can, follow closely with your attention, so you notice the changing physical sensations for the full duration of each in-breath and the full duration of each out-

breath, perhaps noticing the slight pauses between one in-breath and the following out-breath, and between one out-breath and the following in-breath.

9. There is no need to try to control your breathing in anyway at all–simply let the breath breathe itself.
10. Sooner or later, your attention will wander away from the breath. Simply acknowledge where the mind had wandered to. Then gently escort your attention back to the breath.
11. The mind will likely wander over and over again, so each time, remember that the aim is simply to note where the mind has been, then gently escort your attention back to the breath.
12. Continue with the practice, perhaps reminding yourself from time to time that the intention is simply to be aware of your experience in each moment. Use your breath as an anchor to gently reconnect with the here and now each time that you notice that your mind has wandered and is no longer in touch with where you had intended it to be.
13. The sound of the bell will indicate when you should finish your practice. Give yourself a few moments to comprehend what you have just experienced before you call the researcher.

## Appendix 4.2

*Advertising materials for Study 3 and 4 (trans.)*

**Participate in a Reaction-Time Competition and earn £5 plus the chance to win £50 - NATIVE UK STUDENTS ONLY!**

Hi there,

If you are a NATIVE UK student (speak British English as your first language) then you are invited to take part in a study looking at the effects of personality traits and experimental treatments on performance in a fun reaction-time competition.*

In this study, you will be asked to play a reaction-time competition in a laboratory in the School of Psychology, University of Nottingham (University Park), and to perform a few simple unrelated tasks. For 1 hour of your time, you will be given an inconvenience allowance of £5, plus chance to win £50 for fastest reaction time across all participants.

Participation is voluntary, confidential, and greatly appreciated. If you are interested, please email me – Cleo Yusainy at lpxcy@nottingham.ac.uk, with the information about your sex (Male / Female) for administration procedure.

Thank you,
*Researcher : Cleo Yusainy*
*Supervisor : Dr. Claire Lawrence*
*School of Psychology, University of Nottingham*

* Please refrain from participating if you are not a native UK student; or if you have participated in the similar reaction-time competition (game) involving a noise blast in the School of Psychology.

**Appendix 6.1**

*Summary of findings for cross-cultural analysis*

| Dependent measure | British (Chapter 4) | Indonesian (Chapter 5) | Cross-cultural (Chapter 6) |
|---|---|---|---|
| Blast intensity on no provocation, low and high provocations | • Mindfulness reduced aggression for depleted participants under no and low provocations.<br>• Depleted individuals were more aggressive under no and low provocations. | • Mindfulness reduced aggression for depleted participants under low and high provocations.<br>• Depleted individuals were more aggressive under low provocation. | • Mindfulness reduced aggression for depleted participants under all provocation levels.<br>• Depleted individuals and those not receiving mindfulness induction were more aggressive under no and low provocations.<br>• Indonesian male and female participants were more aggressive under all provocation levels.<br>• Mindfulness reduced aggression for depleted females except on high provocation. |
| Maximum blast latency | • Depleted individuals who received mindfulness induction delivered earlier maximum blasts.<br>• Females delivered earlier maximum blasts.<br>• Depleted females who received mindfulness induction delivered earlier maximum blasts. | • Depleted individuals who received mindfulness induction delivered later maximum blasts.<br>• Females delivered later maximum blasts.<br>• Depleted females who received mindfulness induction delivered later maximum blasts. | • Depleted British participants who received mindfulness induction delivered later maximum blasts.<br>• Females delivered earlier maximum blasts. |

| Dependent measure | British (Chapter 4) | Indonesian (Chapter 5) | Cross-cultural (Chapter 6) |
|---|---|---|---|
| Indirect aggression | • Mindfulness did not moderate the link between depletion and ratings of indirect aggression. | • Mindfulness did not moderate the link between depletion and ratings of indirect aggression. | • Indonesians rated the opponent as being more aggressive, more fair and less competitive.<br>• Indonesian males and females rated the opponent as being more aggressive but less competitive, only Indonesian females rated the opponent as being more fair. |
| Self-control performance (handgrip stamina) pre-provocation procedure | • Positive main effect of mindfulness induction on self-control performance.<br>• Females outperformed males. | • Mindfulness moderated the link between depletion and self-control performance.<br>• Positive main effect of mindfulness induction and negative effect of depletion condition on self-control performance. | • Positive main effect of mindfulness induction and negative effect of depletion condition on self-control performance across cultures.<br>• Indonesian participants performed better.<br>• Indonesian males outperformed their British counterparts. |
| Self-control performance (handgrip stamina) post-provocation procedure | • Positive main effect of mindfulness induction on self-control performance. | • Positive main effect of mindfulness induction and negative effect of depletion condition on self-control performance.<br>• Females outperformed males. | • Positive main effect of mindfulness induction and negative effect of depletion condition on self-control performance across cultures. |