

**Moderations involving stereotype threat
and stereotype lift**

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Declaration of Authorship

I, Samuel Kinshuck, hereby declare that this work was carried out in accordance with the Regulations of the University of London. I declare that this submission is my own work, and does not represent the work of others, published or unpublished, except where duly acknowledged in the text. No part of this thesis has been submitted for a higher degree at another university or institution.

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Abstract

Stereotype threat refers to the performance decrement that is typically experienced following exposure to a negative ingroup stereotype. Conversely, stereotype lift refers to the performance enhancement that people typically exhibit when exposed to a positive ingroup stereotype. The current thesis sought to investigate variables that moderate – or whose effects are moderated by - exposure to stereotype threat or stereotype lift. Experiments 1, 2, 3 and 4 provided evidence for the hypothesis that the impact of positive and negative stereotypes on task performance is moderated by regulatory focus (promotion vs. prevention) and motivational state (challenge vs. threat). Experiments 5, 6, 7, 8, 9 and 10 examined the effect of stereotype threat on belief in man-made global warming, both directly and through interactions with a variety of variables: implicit theories of ability, temperature, and the content or framing of a message about man-made global warming. Experiments 11, 12 and 13 examined the extent to which the effects of public and private self-consciousness and self-awareness (the state version of self-consciousness) vary as a function of stereotype threat. In experiments 11 and 12, the “source” of the stereotype threat to which participants were exposed was manipulated – that is, participants were induced to be concerned about displaying stereotypical behaviour to themselves (self-as-source stereotype threat) or to others (other-as-source stereotype threat). As a whole, the results of these experiments indicate that the effects of stereotype threat and stereotype lift are not equivalent across situations, but rather interact with a range of contextual factors in exerting their effects on important outcome variables. The theoretical significance of these findings is discussed.

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Chapter One: Introduction

Stereotype Threat

Stigmatised groups such as Blacks, Hispanics and individuals of low socio-economic status tend to perform worse on IQ tests and other intellectually demanding tasks compared to their non-stigmatized counterparts (Gonzales, Blanton & Williams, 2002; Keller, 2012). Similarly, women tend to exhibit inferior performance relative to men on tests of spatial ability (Mäntylä, 2013). Numerous factors have been proposed to underlie these performance differences - researchers have invoked findings of increased exposure to childhood stress, malnutrition and inadequate education among disadvantaged groups to explain their relatively poor test performance (Gailliot, 2014; Gasquoine, 2009; Sharkey, 2010).

However, evidence suggests that at least part of the intellectual impairment observed among disadvantaged or stigmatized groups stems from a situationally-specific handicap known as stereotype threat (Sackett, Hardison & Cullen, 2004). Stereotype threat refers to the performance decrement that is typically experienced following exposure to a negative ingroup stereotype (Steele & Aronson, 1995). For example, informing women that their gender is characterised by inferior performance on a forthcoming task results in an actual reduction in performance (Spencer, Steele & Quinn, 1999). Likewise, Blacks, Hispanics and individuals of low socio-economic status display worsened performance when reminded of negative task-relevant stereotypes about their respective groups (Thames et al., 2013; Gonzales et al., 2002; Mani, Mullainathan, Shafir & Zhao, 2013).

Moreover, a number of meta-analyses (Flore & Witcherts, 2014; Nguyen & Ryan, 2008; Picho, Rodriguez & Finnie, 2013; Stoet & Geary, 2012; Walton & Cohen, 2003; Walton & Spencer, 2009) have confirmed that stereotype threat exerts a significant influence on the task performance of negatively stereotyped individuals. Although Flore and Witcherts (2014) discovered evidence of publication bias in the stereotype threat literature (studies

with larger samples tend to find lower effect sizes), their meta-analysis nevertheless found a significant effect of stereotype threat consistent with past research. However, it should be noted that the size of stereotype threat's effect on performance (as estimated by the above meta-analyses) is not sufficient in magnitude to generate of the observed performance gaps between certain social groups in the real world (e.g. IQ performance for African-Americans and Caucasian Americans; Wax, 2009). As such, it is likely that the performance gaps observed between stigmatized and non-stigmatized groups on intellectually demanding tests are partly – but not wholly - attributable to stereotype threat.

Indeed, stereotype threat can be activated by cues that are likely to be present in real-world testing situations. For example, simply describing a test as a measure of intelligence (rather than as a learning exercise) is sufficient to enhance the accessibility of the stereotype that 'black people are less intelligent', thereby impairing performance among black individuals (Steele & Aronson, 1995, study 3). Since widely used standardized tests (e.g. the SATs) are typically presented as measures of ability, it follows that performance thereon is likely to be undermined by stereotype threat for members of stigmatized groups (Steele, 1997). Similarly, maths performance among women has been found to be impaired merely as a result of writing one's gender before, rather than after, taking a test (Danaher & Crandall, 2008). Since examinees are often asked to report their gender and other demographic characteristics before beginning a test (Danaher & Crandall, 2008), this implies that stereotype threat has important implications for performance differences across groups in wider society. Likewise, studies showing that the absence of fellow ingroup members in a testing environment can exacerbate the detrimental consequences of negative ingroup stereotypes on performance (e.g. Johns, Inzlicht & Schmader, 2008) indicate that academic contexts in which blacks and females are under-represented could function as stereotype threat triggers (Logel, Iserman, Davies, Quinn & Spencer, 2009). Thus, the performance impairments and other inimical effects associated with stereotype threat present practical issues across a wide range of real-world situations.

As such, an understanding of the mechanisms through which negative stereotypes harm performance, and of effective methods for disrupting the operation of these mechanisms, is of clear theoretical and practical usage in terms of attempts to eliminate racial, socio-economic and gender disparities in test performance. The current work is therefore aimed at identifying the existence of variables that interact with manipulations of stereotype threat to predict performance and other important outcome variables. In doing so, it is hoped that the mechanisms of stereotype threat will be further elucidated, thereby building the groundwork for the development of interventions that can alleviate its inimical effects.

To this end, I will begin by presenting a selective overview of the existing literature on stereotype threat in which I will explore areas of research that are particularly relevant to the questions that I will seek to address. Specifically, I will discuss which types of tasks are susceptible to stereotype threat effects, the causal mechanisms through which stereotype threat operates, the existence of different forms of stereotype threat, and the extent to which stereotype threat constitutes a parallel phenomenon to stereotype lift (the performance improvement resulting from exposure to a positive ingroup stereotype (Walton & Cohen, 2003)). I will also explore similarities between stereotype threat and a motivational phenomenon known as choking under pressure (Baumeister, 1984), with a view to expanding the understanding of stereotype threat by importing principles derived from research on choking under pressure. I will then describe a number of variables that I believe are likely to moderate the effects of, or are likely to be moderated by, stereotype threat, before presenting data from experiments designed to assess these hypothesised interactions.

The Causal Mechanisms of Stereotype Threat

The inimical consequences of exposure to negative stereotypes have been demonstrated for a wide range of tasks, including intelligence tests (Steele & Aronson, 1995), tests of spatial ability (McGlone & Aronson, 2006), maths tests (Spencer et al., 1999), tests of neurocognitive functioning (Suhr & Gunstad, 2002), and long term memory

tests (Hess, Auman, Colcombe, & Rahhal, 2003). Performance on tasks that are social in nature (e.g. sustaining a friendly interaction with a child) is also negatively affected by stereotype threat (Bosson, Haymovitz & Pinel, 2004). Similarly, stereotype threat has been shown to hamper performance on tasks that require the inhibition of habitual tendencies (Jamieson & Harkins, 2007) and implicit racial prejudices (Frantz, Cuddy, Burnette, Ray & Hart, 2004).

One clear unifying feature of these tasks is their reliance on working memory. Working memory is a capacity limited cognitive resource that is recruited in virtually all cognitively demanding tasks (Cowan, 2005). All of the tasks listed above have been shown to recruit working memory resources (Baddeley, 2003). For instance, social interactions require the maintenance and manipulation of socially-relevant information in short term memory, which necessitates the engagement of “social working memory” (Meyer, Spunt, Berkman, Taylor & Lieberman, 2012). Similarly, inhibiting one’s own implicitly-held racial stereotypes recruits similar brain regions to those used in working memory tasks (Stanley, Phelps & Banaji, 2008). On this basis, Schmader, Johns and Forbes (2008) have argued that stereotype threat tends to exert its effects on task performance by draining working memory capacity. Indeed, this mediating role of working memory depletion has been empirically demonstrated (Schmader & Johns, 2003). Moreover, on very easy tasks (which have low working memory demands), evidence indicates that stereotype threat actually has a positive effect on performance (Nguyen & Ryan, 2008).

However, there are some tasks that do not recruit substantial working memory resources but are nevertheless susceptible to stereotype threat-induced impairments. Specifically, motor and athletic tasks (e.g. dribbling a football or shooting a golf ball) are performed more poorly under stereotype threat, even though they are not working memory-dependent (Beilock, Jellison, Rydell, McConnell & Carr, 2006; Chalabaev, Stone, Sarrazin & Croizet, 2008). Beilock et al. (2006; see also Schmader et al., 2008) argue that in the case of these sorts of tasks, the effects of stereotype threat are mediated by a heightened tendency

to monitor one's own motor output. They reason that consciously attending to one's motor behaviours disrupts the automated processes that optimally guide their operation, resulting in impaired task performance. Indeed, it is well documented that people perform worse on motor tasks when instructed to focus consciously on their own motor output (Beckmann, Gröpel & Ehrlenspiel, 2013). Moreover, when participants are subject to cognitive load (diminishing their capacity to consciously process their own motor output), the negative impact of stereotype threat is eliminated (Beilock et al., 2006). Thus, in the case of motor tasks, the detrimental impact of stereotype threat appears to be mediated by a heightened tendency to attend to one's own motor output (Schmader et al., 2008).

In summary, the available evidence suggests that stereotype threat has a negative impact on the performance of motor tasks and cognitively demanding tasks (including social tasks). However, the mechanisms underlying these effects differ for different types of tasks – according to Schmader et al. (2008), performance impairments on cognitively demanding tasks are mediated by working memory depletion, whereas impairments on motor tasks are mediated by a heightened tendency to monitor one's own motor output. Performance on very easy tasks is enhanced under stereotype threat (Nguyen & Ryan, 2008).

However, the question remains as to how stereotype threat triggers this working memory depletion and heightened self-monitoring. Schmader et al. (2008) argue that these processes occur as a result of the cognitive dissonance that stereotype threat evokes. Cognitive dissonance refers to the unpleasant affective state that emerges when an individual holds two or more incompatible cognitions (Festinger, 1956) or a set of cognitions that is incompatible with a desired belief (Steele, 1988). Cognitive dissonance motivates people to alter their thoughts or behaviour in a manner that eliminates the perceived inconsistency (Harmon-Jones, Brehm, Greenberg, Simon & Nelson, 2009). For instance, people who engage in counter-attitudinal behaviour may change their attitudes to be more consistent with their behaviour, thereby resolving the cognitive dissonance between the cognitions “I did X” and “I disapprove of X” (Festinger & Carlsmith, 1959; Harmon-Jones, Brehm,

Greenberg & Simon, 1996; Zanna & Cooper, 1974). Alternatively, when reminded of past counter-attitudinal behaviours, they may commit to making greater effort to behave in a pro-attitudinal manner, thereby eliminating the perceived inconsistency between attitude and behaviour (Stone, Aronson, Crain, Winslow & Fried, 1994).

Schmader et al. (2008) have proposed that when stereotype threat-inducing cues are presented, stereotype-threatened individuals perceive an inconsistency between three cognitions: “Members of group Y lack ability X”, “I am a member of group Y” and “I want to display ability X”. Indeed, people who are subject to stereotype threat often display behaviours that are indicative of attempts to eliminate the cognitive dissonance caused by this inconsistency. For example, they have a tendency to devalue the importance of the stereotyped domain (altering the proposition “I want to display ability X”; Major & Schmader, 1998; Schmader, Major & Gramzow, 2001), to distance themselves from the stereotyped group (altering the proposition “I am a member of group Y” Steele & Aronson, 1995; Pronin, Steele & Ross, 2004) and to cast doubt on the veracity of the negative stereotype (altering the proposition “members of group Y lack ability X”; Von Hippel, Von Hippel, Conway, Preacher, Schooler & Radvansky, 2005).

Moreover, interventions that challenge one of the three inconsistent cognitions have been shown to eliminate or ameliorate the inimical effects of stereotype threat on test performance (Schmader et al., 2008). For instance, procedures that explicitly or implicitly invalidate the negative stereotype (Marx & Roman, 2002; McIntyre, Paulson & Lord, 2003; Smith & White, 2002), that cause the stereotype-threatened individual to feel distinct from the stereotyped group (Shih et al., 1999) or that inhibit the desire to display the stereotype-relevant ability (Aronson et al., 2002; Mendoza-Denton, Kahn & Chan 2008) have been found to reduce the impact of stereotype threat on test performance. Consistent with Schmader et al.’s (2008) reasoning, this indicates that the effects of stereotype threat on performance result from the cognitive dissonance that it evokes. When new information is

presented to help resolve this cognitive dissonance, the effects of stereotype threat on performance are eliminated.

Schmader et al. (2008) propose three distinct causal pathways by which stereotype threat-induced cognitive dissonance causes working memory depletion, thereby impairing task performance. One of these proposed causal pathways (pathway 1) involves the internal monitoring processes that are activated by the cognitive dissonance that stereotype threat induces. One way for an individual to resolve stereotype threat-induced cognitive dissonance is to invalidate the negative stereotype by demonstrating his or her own ability in the stereotyped domain (Schmader et al., 2008). By showing that they themselves have high ability, people can provide a counter-example to the stereotype, thereby calling its veracity into question (Jamieson & Harkins, 2007; Marx & Roman, 2002; McIntyre et al., 2003). This enables them to abandon the “my group lacks ability X” cognition, thus resolving the stereotype threat-induced cognitive dissonance. Consequently, stereotype threat increases people’s motivation to display high ability in the stereotyped domain as a means of eliminating the cognitive dissonance that it induces.

According to Schmader et al. (2008), the consequent desire to perform well in situations that evoke stereotype threat renders the prospect of making a mistake particularly daunting, leading to a tendency to monitor one’s own behaviour in order to ensure the absence of mistakes. Indeed, there is a general tendency to attend more closely to information that is perceived as threatening or potentially harmful (Öhman, Flykt & Esteves, 2001). Since stereotype threat causes people to view personal errors as harmful to their self-perceived ability, it follows that they would attend more closely to such errors and to the behaviours believed to be linked to them (Schmader et al., 2008)

Likewise, stereotype-threatened individuals are likely to monitor their own internal mental state in order to identify thoughts or feelings that could be detrimental for performance, so that these can be suppressed (Logel et al., 2009). According to Schmader et

al. (2008), this is why stereotype threat results in an enhanced tendency to monitor one's own motor output and internal thought processes.

Indeed, studies have found that stereotype threat enhances the intensity of neural activity linked to error monitoring (Forbes, Schmader & Allen 2008), and that stereotype-threatened individuals are particularly quick to correct their own mistakes when they occur (Jamieson & Harkins, 2007). Moreover, stereotype threat triggers increased attention towards words related to negative thoughts and feelings (e.g. anxiety-related words; Johns et al., 2008), which is indicative of increased monitoring of these thoughts and feelings. Thus, Schmader et al. (2008) argue that the increased monitoring of one's own motor output that is observed in the context of stereotype threat results from an increased motivation to avoid errors. Increased monitoring for negative thoughts and feelings occurs for the same reason.

Schmader et al. (2008) argue further that these monitoring processes are deliberative and effortful, meaning that their operation drains working memory resources. Indeed, evidence shows that monitoring for any internal or external signal can take up working memory capacity (Vogel & Luck, 2002). Moreover, there is evidence suggesting that the monitoring processes that arise amongst stereotype-threatened individuals can be inhibited through the imposition of cognitive load, which indicates that these processes require working memory capacity to operate (Beilock et al., 2006). Thus, according to Schmader et al. (2008), the heightened monitoring that occurs among stereotype-threatened individuals is one of the causes of working memory depletion. Hence, the first causal pathway linking stereotype threat-induced cognitive dissonance to working memory depletion in Schamder et al.'s (2008) model involves the tendency to monitor for errors and for negative thoughts and emotions.

The second causal pathway linking stereotype threat-induced cognitive dissonance and working memory depletion involves the physiological processes that are believed to be activated by the former. Schmader et al. (2008) note that cognitive dissonance generally evokes increased physiological arousal (Croyle & Cooper, 1983; Harmon-Jones et al., 1996),

which is also observed in the specific case of stereotype threat. For example, stereotype threat has been shown to lead to increases in blood pressure (Blascovich, Spencer, Quinn & Steele, 2001) and heightened blood concentrations of the stress hormone cortisol (Townsend, Major, Gangi & Mendes, 2011). These physiological responses are known to be detrimental to performance on working memory tasks (Elzinga & Roelofs, 2005), leading Schmader et al. (2008) to the conclusion that stereotype threat-induced working memory impairment is partly mediated by physiological arousal. Indeed, stereotype threat has been found to enhance performance on tasks for which heightened stress is beneficial, such as very easy tasks (Nguyen & Ryan, 2008; O'Brien & Crandall, 2003). Thus, evidence suggests that working memory depletion under stereotype threat is partly mediated by the enhanced physiological arousal that it evokes.

The third causal pathway linking stereotype threat-induced cognitive dissonance to working memory depletion in Schmader et al.'s (2008) model involves a heightened tendency to suppress negative thoughts and feelings. As noted above, evidence suggests that stereotype-threatened individuals monitor their own mental state in order to identify negative thoughts and feelings (as per pathway 2). According to Schmader et al. (2008), people experiencing stereotype threat seek to suppress these thoughts and feelings when they are detected, because they are perceived to have a negative influence on task performance. Consequently, stereotype threat leads to heightened attempts to suppress negative thoughts and feelings.

Johns et al. (2008) produced evidence for this proposed mediating role of suppression using a task designed to assess participants' attentional biases, known as the dot-probe task (MacLeod & Matthews, 1988). This task assesses reaction times to respond to a dot that appears on one of two positions on a computer screen. Before the dot appears, a stimulus (in this case a word) is presented in one of these two positions. If participants respond faster when the dot appears in a position previously occupied by a particular type of word, then an attentional bias to that class of word can be inferred. For example, in Johns et

al.'s (2008) experiment, stereotype-threatened women were quicker to respond to the dot when it appeared in the position previously occupied by an anxiety-related (vs. neutral) word compared to control women, indicating an attentional bias to anxiety-related stimuli.

However, when the stereotype-threatened women were told how this task worked prior to taking it, they did not display the attentional bias. Johns et al. (2008) therefore concluded that the stereotype-threatened women in their experiment were attempting to suppress overt displays of anxiety – when they were unaware of how the dot-probe task worked, they had no way to conceal their attentional bias towards anxiety-related words. When they were given the informational tools to enable them to avoid displaying their anxiety, they successfully did so. This suggests that stereotype threat induced a tendency to attempt to suppress negative emotions, because the mechanisms involved in concealing public displays of emotion are the same as those involved in inhibiting internal emotional experiences (Wegner, 2009).

Further evidence to support the mediating role of suppression in driving the effects of stereotype threat comes from a series of studies undertaken by Logel et al. (2009). These studies assessed the extent to which stereotype-threatened individuals exhibited cognitive symptoms that are known to be associated with suppression attempts (Wegner, 2009). When people attempt to suppress a particular thought or feeling, two separate cognitive processes are activated: the first process (known as the ironic process) operates automatically and attempts to detect the to-be-suppressed thoughts or feelings in order to monitor whether or not the goal to suppress them is being achieved. The second process recruits working memory resources and seeks to focus the individual's attention on information that is unrelated to the thoughts and feelings that they are attempting to suppress (Wenzlaff & Wegner, 2000). When cognitive load is imposed, the second process functions less effectively, because it requires cognitive resources. Conversely, the first process continues to operate under cognitive load, because the process of simply monitoring for a particular

thought or feeling requires minimal cognitive resources (Wegner, 2009).¹ Consequently, cognitive load produces a paradoxical increase in the accessibility of thoughts and feelings that the individual is attempting to suppress because the ironic process, which monitors for to-be-suppressed information, remains active whilst the individual no longer has the cognitive resources to actively bring unrelated thoughts to mind (Wegner, 2009). Increased accessibility of a particular thought under cognitive load can therefore serve as an indication that the thought in question is being suppressed.

Using this principle, Logel et al. (2009, study 2) found that that stereotype-threatened individuals attempt to suppress negative stereotype-related information. Specifically, women under stereotype threat were quicker to make word/non-word discriminations for negative stereotype-related words relative to stereotype-irrelevant words (indicating enhanced accessibility of the former). However, this was only true when cognitive load was imposed, indicating that the stereotype-threatened women in Logel et al.'s (2009, study 2) experiment were attempting to suppress negative stereotype-related words (see also Logel et al., 2009, studies 3-5).

According to Schmader et al. (2008), this suppression is one of the causes of working memory depletion under stereotype threat. Evidence indicates that the suppression of thoughts or feelings requires working memory resources (Wenzlaff & Wegner, 2000), meaning that the heightened tendency to suppress negative stereotype-related thoughts and feelings that occurs in the context of stereotype threat (Logel et al., 2009) is likely to be a cause of the working memory depletion that occurs therein. Thus, the third causal pathway

¹ It should be noted that the view that monitoring for a given thought does not require cognitive resources (Wegner, 2009) contradicts Schmader et al.'s (2008) view that the monitoring processes operating in the context of stereotype threat deplete working memory. The balance of evidence appears to support Wegner's (2009) position. Wegner (2009) presents a large body of evidence showing that people can efficiently monitor for specific thoughts and emotions, whereas Schmader et al.'s (2008) sole piece of supporting evidence for the reverse claim comes from a study that examined people's capacity to monitor for external visual stimuli over long periods of time (Grier, Warm Dember, Matthews, Galinsky & Parasuraman, 2003). Moreover, Schmader inferred that the monitoring task used by Grier et al. (2003) had taxed working memory simply because Grier et al. (2003) observed performance decrements over time, but these decrements may in fact have been attributable to other factors, such as declining motivation.

linking stereotype threat-induced cognitive dissonance to working memory depletion in Schmader et al.'s (2008) model involves a heightened tendency to suppress negative thoughts and feelings.

Thus, according to Schmader et al. (2008), working memory depletion due to physiological arousal, monitoring processes and suppression of negative thoughts and feelings leads to impaired performance on cognitively demanding tasks under stereotype threat. However, Schmader et al. (2008) note that the effects of stereotype threat are not limited to cognitively demanding tasks. For instance, stereotype threat impairs performance on motor tasks (Heidrich & Chiviakowsky, 2015) and enhances performance on easy tasks (Nguyen & Ryan, 2008; O'Brien & Crandall, 2003), neither of which are heavily dependent on working memory capacity. Since working memory depletion therefore cannot account for the effects of stereotype threat on these tasks, Schmader et al. (2008) postulate a different causal pathway to account for these effects.

Specifically, Schmader et al. (2008) argue that the heightened tendency to monitor one's own behaviour for errors that is induced by stereotype threat impairs the performance of motor tasks. Indeed, there is evidence showing that consciously monitoring one's own actions is detrimental to the performance of motor tasks (Beckmann et al., 2013). Moreover, alterations to the performance setting that prevent people from consciously monitoring their own movements have been shown to eliminate the deleterious effects of stereotype threat on motor task performance (Beilock, Carr, MacMahon & Starkes, 2002). Thus, according to Schmader et al. (2008), the heightened tendency to monitor one's own motor output that is induced by stereotype threat leads to impairments in task performance.

Regarding easy tasks, Schmader et al. (2008) argue that the cognitive dissonance induced by stereotype threat increases people's motivation to perform well – doing so would invalidate the negative stereotype and thereby resolve the individual's cognitive dissonance. Indeed, studies have shown that stereotype threat increases people's desire to perform well

on stereotype-related tasks (Jamieson & Harkins, 2007). Schmader et al. (2008) propose that this heightened motivation leads to enhanced performance on easy tasks.

This line of reason begs an obvious question – if an increased motivation to perform well under stereotype threat leads to superior performance on easy tasks, then why would the same not be true on more difficult tasks and motor tasks? Schmader et al. (2008) answer that in the case of difficult tasks - which are working memory-dependent - the detrimental impact of working memory depletion overshadows the beneficial effect of increased motivation. Likewise, for motor tasks, the inimical effect of self-monitoring overshadows the beneficial impact of increased motivation. Conversely, easy tasks are not working memory-dependent and are thus not subject to performance decrements when working memory resources are depleted under stereotype threat. Consequently, stereotype threat-induced increases in motivation lead to enhanced performance on easy tasks, even though the same effect is not observed for other tasks.

Schmader et al.'s (2008) model is summarised in Figure 1. The model proposes that situations and cues that evoke stereotype threat cause a state of cognitive dissonance. This cognitive dissonance results in the operation of a monitoring process (whereby the individual monitors for negative thoughts and feelings and for personal errors), heightened physiological anxiety and an increased tendency to suppress negative thoughts and feelings. These processes all lead to working memory depletion, resulting in impaired performance on cognitively demanding tasks. Additionally, the monitoring processes activated by stereotype threat impair performance on motor tasks, and the increased motivation to perform well resulting from stereotype threat-induced cognitive dissonance leads to enhanced performance on easy tasks. Note that Schmader et al. (2008) imply (without stating explicitly) that *all* the processes outlined in their model arise in *all* instances of stereotype threat.

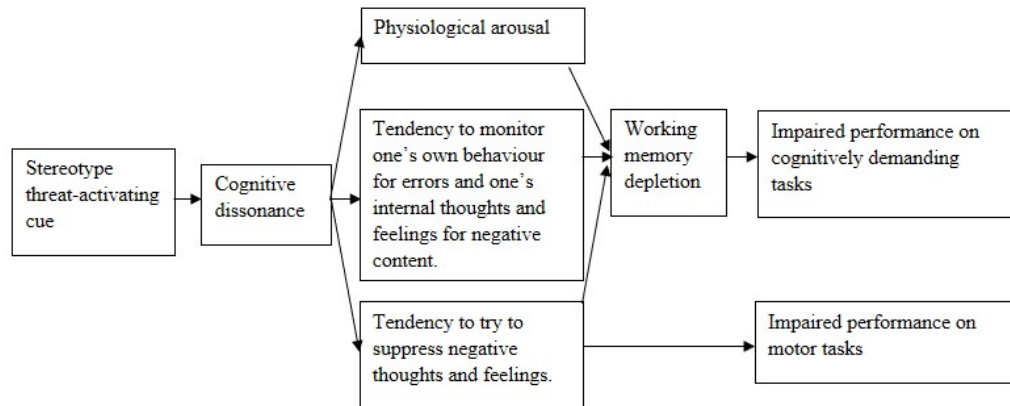


Figure 1

Causal Mechanisms of Stereotype Threat in Schmader et al.'s (2008) model

Different Varieties of Stereotype Threat

Stereotype threat has typically been understood as a unitary phenomenon, with researchers assuming that all occurrences of stereotype threat can be directly equated (Steele, 1997; Steele & Aronson, 1995). However, Shapiro and Neuberg (2007; Shapiro, 2011) have argued that a given individual in a particular situation may experience one of a variety of types of stereotype threat. According to the Multi-Threat Framework presented by these authors, there are different forms of stereotype threat that vary on two dimensions: source (self, ingroup, or outgroup) and target (self or group). Ingroup-as-source stereotype threat arises when the stereotype-threatened individual is concerned about the possibility of confirming the negative stereotype in the minds of other ingroup members. Outgroup-as-source stereotype threat arises when the stereotype-threatened individual is concerned about the possibility of confirming the negative stereotype in the minds of outgroup members. Self-as-source stereotype threat arises when the stereotype-threatened individual is concerned about the possibility of confirming the negative stereotype within their own mind. Outgroup- and ingroup-as-source stereotype threat are sometimes grouped together as other-as-source stereotype threat. Thus, Shapiro and Neuberg (2007) argue that stereotype-

threatened individuals worry about how poor performance on their part will enhance endorsement of the negative stereotype among different types of people. The person or people whose opinion the stereotype-threatened individual is concerned about constitute(s) the ‘source’ of the stereotype threat.

The ‘target’ dimension in Shapiro and Neuberg’s (2007) framework draws upon research showing that people seek to preserve favourable beliefs about themselves (McKay & Dennet, 2009; Sedikides, Gaertner & Cai, 2015) and about the groups to which they belong (Tajfel & Turner, 1986; Van Bavel, Packer & Cunningham, 2011). Group-as-target stereotype threat arises when the stereotype-threatened individual is concerned about the possibility of damaging the image of their group through poor performance. Self-as-target stereotype threat arises when the stereotype-threatened individual is concerned about the possibility of damaging their own personal reputation through poor performance (Shapiro, 2011). Hence, within Shapiro and Neuberg’s (2007) framework there are six possible varieties of stereotype threat emerging from the crossing of the target (self vs. group) and source (self vs. ingroup vs. outgroup) dimensions. However, Shapiro and Neuberg (2007) note that, in principle, it would be possible for two or more different forms of stereotype threat to arise simultaneously – for instance, woman X might worry about giving men a negative impression both of the maths ability of women in general *and* of herself in particular, resulting in a combination of outgroup-as-source/group-as-target and outgroup-as-source/self-as-target stereotype threat.

A fairly strong body of evidence has been collected in support of Shapiro and Neuberg’s (2007) classification system. For instance, Shapiro, Williams and Hambarchyan (2013) told female participants that the forthcoming task was designed to measure their individual intellectual ability (self-as-target stereotype threat) or the typical intellectual ability of women in general (group-as-target stereotype threat). They found that engaging in self-affirmation (i.e. reminding oneself of positive personal characteristics) improved performance for participants who were subject to self-as-target stereotype threat, whilst

group affirmation (i.e. reminding oneself of positive characteristics associated with one's group) improved performance for participants who were subject to group-as-target stereotype threat.

Shapiro et al. (2013) reasoned that the participants who were subject to self-as-target stereotype threat would have been concerned primarily about preserving the integrity of their own personal self-concept. Therefore, establishing this integrity through self-affirmation would have reduced the perceived threat, thereby improving performance. Conversely, participants who were subject to group-as-target stereotype threat would have been concerned about preserving the integrity of their group identity, so that establishing the group's value through group affirmation would have reduced the perceived threat, thereby enhancing performance. Shapiro et al.'s (2013) results therefore support the view that there are important psychological differences associated with self- and group-as-target of stereotype threat.

There is also evidence to support the validity of the source dimension of the Multi-Threat Framework. For instance, research shows that people are motivated to perform well on ability-diagnostic tests even when their results will be known only to themselves (Leary, Barnes, Griebel, Mason & McCormack, 1987), indicating that people care about maintaining a positive view of their own ability. This is consistent with Shapiro and Neuberg's (2007) proposal that under self-as-source stereotype threat, people are concerned about how their test performance will influence their own consequent beliefs about their personal ability or their group's ability. Likewise, research shows that people are concerned about the public reputational consequences of their behaviour (Cialdini, 2001). Indeed, even subtle social cues, such as exposure to a pair of eyes, are sufficient to induce people to behave in a socially desirable manner (Bourrat, Baumard & McKay, 2011; although see Northover, Pederson, Cohen & Andrews, 2016). This is consistent with Shapiro and Neuberg's (2007) claim that stereotype threat can involve concerns relating to the desire to cultivate favourable impressions among ingroup or outgroup others.

Moreover, Shapiro and Neuberg's (2007) model predicts that an individual will be more likely to experience self-as-source stereotype threat if they endorse the negative stereotype in question. People are generally more prone to infer stable traits (such as low ability) based on an actor's behaviour if the trait in question is consistent with a stereotype associated with the actor's group (Hugenberg & Bodenhausen, 2003). Thus, an individual who endorses a stereotype about their own group's low ability will be more likely to infer low personal ability based on poor performance on a stereotype-related task compared to a member of the same group who does not endorse the stereotype. Consequently, a stereotype-endorsing individual would have more reason to fear the negative impact of poor performance on a stereotype-related task on their own sense of self-perceived competence. Therefore, the extent to which an individual endorses the validity of a stereotype should be positively correlated with their proneness to experience self-as-source stereotype threat, but not outgroup-as-source or ingroup-as-source stereotype threat. Using a self-report measure of the different types of stereotype threat, Shapiro (2011) found that this was indeed the case. Thus, evidence indicates that different forms of stereotype threat can vary along the source dimension proposed by Shapiro and Neuberg (2007).

However, there is currently no experimental evidence supporting the existence of Shapiro and Neuberg's (2007) proposed source dimension. That is, no studies have heretofore attempted to manipulate the source of the stereotype threat being induced in order to determine whether the effect of such a manipulation corresponds to what would be predicted on the basis of Shapiro and Neuberg's (2007) model. Consequently, one of the aims of the current thesis was to test the source dimension of Shapiro and Neuberg's (2007) using experimental, rather than correlational, designs.

Stereotype Lift

The negative effects of stereotype threat on performance are mirrored by a parallel phenomenon known as stereotype lift. Stereotype lift refers to the performance gain that is typically observed when individuals are exposed to a positive stereotype about their own

group (Walton & Cohen, 2003). Of relevance to the understanding of both stereotype threat and stereotype lift is the degree of overlap between the mechanisms underlying these two phenomena.

For instance, the physiological responses associated with stereotype threat and stereotype lift appear to correspond to those that characterise the polar-opposite 'Motivational States' known in the motivation literature as 'Threat' and 'Challenge', respectively (Vick, Seery, Blascovich & Weisbuch, 2008). According to the biopsychosocial model (Blascovich, 2008), individuals are likely to view a forthcoming task as a challenge when they perceive the resources available to them (e.g. personal ability) as exceeding the demands of the task (e.g. difficulty level). When demands are perceived to outweigh resources, the task is likely to be evaluated as a threat (Blascovich, Mendes, Tomaka, Salomon & Seery, 2003).

Challenge and threat have been linked to distinct physiological profiles - challenge is characterised by increased heart rate and cardiac output (i.e. the amount of blood circulated by the heart in a given time period) relative to a resting state; threat is characterised by increased heart rate but reduced cardiac output (Seery, 2011). Thus, the challenge-threat variable is unidimensional: high challenge necessarily implies low threat, and high threat necessarily implies low challenge (Seery, 2011). The fact that the physiological responses induced by stereotype threat and stereotype lift correspond to those typical of threat and challenge, respectively (Vick et al., 2008), therefore indicates that stereotype lift and stereotype threat might operate via similar mechanisms, rather than lift and threat being qualitatively different phenomena. It follows that the effects of stereotype lift and stereotype threat might potentially be moderated by similar variables. Exploring this possibility was among the aims of the current thesis.

Choking Under Pressure

In addition to stereotype lift, there is another motivational phenomenon that has important similarities with stereotype threat, and that is known as ‘choking under pressure’ (CUP). CUP refers to performance impairment that tends to be observed when the subjective importance of strong performance (i.e. ‘pressure’) is increased (Baumeister, 1984). This increase in pressure can be induced by offering large financial incentives (Ariely, Gneezy, Loewenstein & Mazar, 2009), by presenting the possibility of social evaluation (McKay, Lewthwaite & Wulf, 2012), or by creating a perception of physical danger (Pijpers, Oudejans & Bakker, 2005).

Stereotype threat and CUP share a number of common features. Both are characterised by increased anxiety (Bosson et al., 2004; Mesagno, Harvey & Janelle, 2012), a heightened tendency to monitor one’s own behaviour and motor output (Beckmann et al., 2013; Beilock et al., 2006), and physiological profiles indicative of threat (as opposed to challenge; Allen, Blascovich & Mendes, 2002; Blascovich, Mendes, Hunter & Salomon, 1999; Derks, Scheepers, Van Laar, & Ellemers, 2011; Vick et al., 2008). Moreover, the effects of both CUP and stereotype threat are more pronounced for tasks with high working memory demands (Beilock & Carr, 2005; Schmader et al., 2008), and they can be ameliorated with similar interventions (Beilock et al., 2006; Beilock & Carr, 2001), such as stimulation of the right cerebral hemisphere (Beckmann et al., 2013; Chalabaev, Radel, Masicampo & Dru, 2016) or mindfulness training (Bellinger, De Caro & Ralston, 2015; Weger, Hooper, Meier & Hopthrow, 2012)

Is it therefore very likely that our understanding of stereotype threat could be informed through consideration of the factors that drive the effects of CUP. One could even argue that stereotype threat should be viewed as a particular form of CUP, rather than as a separate phenomenon that happens to have certain similarities. CUP is defined as the performance decrement that results from an increase in the perceived importance of strong performance (Baumeister, 1984). Stereotype threat fits this definition. Exposure to a

negative task-related stereotype about one's ingroup enhances the perceived importance of performing well on the task in question, because strong performance is perceived as a means to invalidate the stereotype (Jamieson & Harkins, 2007). Indeed, researcher's definitions of stereotype threat often strongly imply that it is a form of CUO. For instance, Weger et al. (2011, pp.471) define stereotype threat as "the *pressure* resulting from social comparisons that are perceived as unfavourable" (emphasis added). Thus, there is both an empirical and a theoretical justification for the notion that our understanding of stereotype threat is likely to be enhanced by drawing upon research from the CUP literature. From the perspective of the current thesis, this means that variables that have been found to modulate the effects of pressure on performance can be considered as likely candidates to moderate stereotype threat effects.

Variables that are likely to moderate the effects of Stereotype Threat

Having presented a brief overview of the most pertinent areas of research in the stereotype threat literature, I will next examine how this research can inform hypotheses about likely moderators of the effects of stereotype threat. The potential moderating variables that will be explored are regulatory focus, motivational state, implicit theories about the nature of ability, public and private self-consciousness, and public and private self-awareness.

Regulatory Focus

Regulatory Focus Theory (RFT; Higgins, 1998) proposes the existence of two motivational systems that guide goal pursuit in qualitatively different ways. The 'promotion' system is concerned with ideals, aspirations, nurturance and advancement, whereas the 'prevention' system is concerned with duties, obligations, safety and security (Higgins, 1998). When an individual's promotion system is activated, they become "promotion focused", meaning that they focus on promoting improvements in their current state. Conversely, when an individual's prevention system is activated, they become 'prevention focused', meaning that they focus on preventing deterioration in their current state (Higgins,

2002). An individual's regulatory focus refers to the extent to which they are promotion or prevention focused. Regulatory foci exist as stable individual difference variables arising from differences in the chronic accessibility of information relevant to the promotion or prevention systems (Higgins, Friedman, Harlow, Idson, Ayduk & Taylor, 2001). However, the activation of the promotion and prevention systems can also be influenced by situational factors. For instance, asking a person to complete a task in which correct responses gain points (whilst incorrect responses do not gain points) induces a promotion focus, whereas asking them to complete a task in which incorrect responses lose points (and correct responses prevent point losses) induces a prevention focus (Liberman, Idson, Camacho & Higgins, 1999).

Studies employing these experimental manipulations have found that promotion and prevention foci are differentially associated with a wide range of cognitive, behavioural and affective characteristics. Compared to prevention focused individuals, promotion focused individuals tend to be more tolerant of risk (Crowe & Higgins, 1997), more creative (Friedman & Förster, 2005), more responsive to instructions to make approach motor movements (moving the hands towards the body) rather than avoidance movements (moving the hands away from the body; Förster, Grant, Idson & Higgins, 2001), more likely to process visual input in a holistic manner (Förster & Higgins, 2005), more likely to capitalise on opportunities to gain points on a task at the expense of opportunities to avoid losing points (Shah, Higgins & Friedman, 1998; Förster, Higgins & Idson, 1998; Förster et al., 2001), and more likely to experience joy (rather than relief) in response to success and disappointment (rather than distress) in response to failure (Scholer & Higgins, 2008).

These differences between promotion and prevention focused individuals can be understood as a manifestation of the respective preferences for seeking advancement and preventing deterioration. For instance, risky courses of action generally carry the possibility of both gain (advancement) and loss (deterioration), whereas conservative courses of action generally involve a low likelihood of both gain and loss (Crowe & Higgins, 1997).

Promotion focused individuals are more motivated by the prospect of achieving gains than of preventing losses (Higgins, 1998), such that the enhanced opportunity for gain afforded by a risky alternative carries more motivational weight than the associated possibility of incurring a loss. Consequently, promotion focused decisions prefer high risk options (e.g. a 50% chance of gaining £10 coupled with a 50% chance of losing £10) to relatively low risk options (e.g. a 50% of gaining £5 coupled with a 50% chance of losing £5), because the appeal of potential gains outweighs the fear of potential losses of equal magnitude and probability. Conversely, prevention focused individuals would ascribe greater motivational weight to the possibility of loss than to the possibility of gain, making a risky alternative seem less appealing than a corresponding conservative option. This explains why promotion focused individuals tend to be more tolerant of risk than prevention focused individuals (Crowe & Higgins, 1997). Thus, the behavioural, cognitive and affective characteristics associated with promotion and prevention foci can be understood as a manifestation of a general preference for maximising gains (in the case of promotion) or minimising losses (in the case of prevention; Scholer & Higgins, 2013).

Regulatory Fit. A key concept within Regulatory Focus Theory is the notion of regulatory fit. Regulatory fit is a state that arises when two situational factors, or one situational factor and one dispositional factor, induce the same regulatory focus (Cesario, Grant & Higgins, 2004; Förster et al., 1998; Lee & Aaker, 2004; Shah et al., 1998; Spiegel, Grant-Pillow & Higgins, 2006; Worthy, Markman & Maddox, 2009). For example, Maddox, Baldwin and Markman (2006) conducted a study in which two separate manipulations of regulatory focus were crossed with each other. The first manipulation involved telling participants that strong task performance would be rewarded with a financial gain (inducing a promotion focus) or with the prevention of a financial loss (inducing a prevention focus). The second manipulation involved telling participants that correct responses on the task would gain points whilst incorrect responses would not (inducing a promotion focus) or that incorrect responses on the task would lose points whilst correct responses would not

(inducing a prevention focus). Maddox et al. (2006) observed an interaction between the two manipulations - performance was enhanced in the conditions where the two manipulations were matched in terms of the regulatory focus that they induced. In other words, performance was enhanced when the two separate manipulations both induced a promotion focus and when they both induced a prevention focus compared to when incongruent regulatory foci were induced, indicating that regulatory fit enhances task performance (see also Plessner, Unkelbach, Memmert & Baltes, 2009; Renkema & Van Yperen, 2008; Shah et al., 1998; Worthy et al., 2009). Regulatory fit is also associated with increased message persuasiveness (Cesario et al., 2004), increased task enjoyment (Freitas & Higgins, 2002), and heightened perceptual fluency (Lee & Aaker, 2004).

Why might regulatory focus modulate the effects of stereotype threat? Evidence indicates that exposure to a positive or negative task-related stereotype induces a promotion or prevention focus, respectively (Seibt & Förster, 2004). In light of the principle of regulatory fit, it follows that other manipulations of regulatory focus should interact with manipulations of stereotype valence to predict task performance. For instance, consider a scenario in which a manipulation of stereotype valence (positive vs. negative) is crossed with a manipulation of a task's scoring system (correct responses gain points vs. incorrect responses lose points). The gain-based point system and exposure to the positive stereotype would both induce a promotion focus, while the loss-based point system and exposure to the negative stereotype would both induce a prevention focus (Lieberman et al., 1999; Seibt & Förster, 2004). Regulatory fit should therefore be higher (leading to enhanced performance) for participants exposed to the negative stereotype coupled with the loss-based point system or the positive stereotype coupled with the gain-based point system. The same pattern would be expected whenever any other manipulation of regulatory focus is crossed with a manipulation of stereotype valence. Thus, based on the principle of regulatory fit, one can hypothesise that the effects of stereotype threat and stereotype lift on task performance are likely to be moderated by regulatory focus.

This prediction was tested by Grimm, Markman, Maddox and Balwin (2009) using the aforementioned design. These authors found that task performance was optimised when stereotype threat was coupled with a loss-based point system and when stereotype lift was coupled with a gain-based point system, compared to the conditions in which stereotype valence and point system were mismatched in terms of regulatory focus. However, Keller and Bless (2008; see also Keller, 2007) produced conflicting results in a study with virtually the same design as Grimm et al.'s (2009). Specifically, Keller and Bless (2008) found that participants who were presented with a loss-based point system performed better following exposure to a positive (rather than negative) stereotype, whereas participants who were presented with a gain-based point system performed better following exposure to a negative (rather than positive) stereotype.

In chapter 2, I will attempt to resolve this apparent inconsistency in the results produced by Grimm et al. (2009) and Keller and Bless (2008), and will seek to test the proposed resolution empirically. In short, I will argue that Keller and Bless' (2008) point system manipulation was actually a manipulation motivational state (not regulatory focus). I will then attempt to show that Keller and Bless' (2008) results are consistent with the hypothesised interaction between manipulations of stereotype valence and manipulations of motivational state that will be proposed in the following section. The nature of the interaction between regulatory focus and stereotype threat vs. lift – which, in Chapter 2, I will argue is consistent with the proposals of Grimm et al. (2009) – will henceforth be referred to as general research question 1.

Motivational States

As mentioned above, an individual's motivational state refers to the extent to which an individual perceives a forthcoming task as a challenge or as a threat (Blascovich, 2008). Challenge is experienced when the individual perceives that the resources available to them outweigh the demands of the task; threat is experienced when the individual perceives the demands of the task to outweigh their resources (Blascovich et al., 2003). It should be noted,

however, that challenge and threat states only tend to arise when a task is perceived as important – when the outcome of a task is perceived as inconsequential, neither challenge nor threat will be experienced (Blascovich & Mendes, 2010; Tomaka, Blascovich, Kibler & Ernst, 1997).

As noted above, challenge and threat are characterised by distinct physiological profiles. Challenge is associated with increased heart rate relative to rest, increased cardiac output (the amount of blood pumped by the heart in a given unit of time), and reduced total peripheral resistance (the physical resistance to blood flow throughout the circulatory system). Threat is associated with increased heart rate relative to rest, decreased or unchanged cardiac output (in spite of the increased heart rate), and increased total peripheral resistance (Seery, 2011). Moreover, there are a number of biological markers of challenge and threat states. For instance, increased blood levels of the hormone cortisol are associated with threat (Blascovich & Mendes, 2010).

A number of studies indicate that performance is impaired whenever two situational variables both induce the same motivational state, whereas performance is enhanced when two situational variables induce different motivational states. For instance, the presence of an audience in an unrehearsed performance situation is associated with increased threat (Allen et al., 2002; Blascovich et al., 1999). When participants are initially induced to view a forthcoming task as a challenge, they perform better in front of an audience than alone. In contrast, they perform better alone (than in front of an audience) if they are initially induced to view the task as a threat (Feinberg & Aiello, 2010). Similarly, Schmader, Forbes, Zhang and Mendes (2009) found that participants who reported high levels of anxiety (indicating threat; Skinner & Brewer, 2004) performed better on a cognitively demanding task when they were primed with the concept of confidence (inducing challenge) rather than doubt (inducing threat). Conversely, being primed with doubt (vs. confidence) was associated with superior performance amongst individuals who initially reported low levels of anxiety. Drach-Zahavy and Erez (2002) found that an experimental induction of challenge improved

performance in the context of high difficulty (which is linked to increased threat; Moore, Vine, Wilson & Freeman, 2014), but not in the context of low difficulty. Similarly, exposure to two separate positive task-related stereotypes about one's ingroup (both of which would be expected to induce challenge; Vick et al., 2008) leads to inferior performance compared to exposure to a single positive stereotype (Rosenthal & Crisp, 2007).

Likewise, Moore, Vine, Wilson and Freeman (2015) assessed the impact of motivational state on performance of a difficult competitive task that was described in a way that induced threat (as assessed by measures of cardiac output and total peripheral resistance). After a period of baseline performance, half of the participants were told that physiological arousal could improve performance and the other half were told nothing. Ongoing physiological measurements showed that this 'arousal reappraisal' instruction resulted in increased challenge relative to the 'no instructions' condition. Subsequent to this instruction phase of the task, performance was superior among participants in the arousal reappraisal condition, indicating that the combination of a factor that induced threat (the original task instructions) and a factor that induced challenge (the reappraisal instructions) resulted in enhanced performance relative to a single threat-inducing factor.

Similarly, Kang, Galinsky, Kray and Shirako (2015) found that an experimental induction of high social power (which induces challenge; Scheepers, de Wit, Ellemers & Sassenberg, 2012) led to improved task performance relative to low social power when paired with instructions stating that the task was ability diagnostic (which are likely to induce threat; Putwain, Langdale, Woods & Nicholson, 2011), but not in the absence of these instructions. Overall, therefore, evidence indicates that performance is enhanced when two situational or dispositional factors induce different motivational states. Note that this contrasts with the principle of regulatory fit, which states that performance is enhanced when two separate factors induce the *same* regulatory focus (Higgins, 2005).

Why might motivational state moderate the effects of stereotype threat? The notion that performance is enhanced when two factors induce different motivational states allows

the derivation of a hypothesis about how the effects of stereotypes on performance are likely to be moderated by separate manipulations of motivational state. Given that stereotype lift is associated with increased challenge (Vick et al., 2008), it is likely that the induction of threat by a separate factor will enhance performance relative to the induction of challenge in the context of a positive stereotype. Conversely, given that stereotype threat is associated with increased threat² (Vick et al., 2008), it is likely that the induction of challenge by a separate factor will enhance performance relative to the induction of threat in the context of a negative stereotype. This proposed interaction between stereotype threat and motivational state will henceforth be referred to as general research question 2 and will be tested in this thesis.

Of relevance to general research question 2 is a study conducted by Alter, Aronson, Darley, Rodriguez, and Ruble (2010). These authors manipulated stereotype threat (exposure to a negative stereotype vs. no exposure to a negative stereotype) and motivational state (challenge vs. threat). Consistent with the aforementioned reasoning, they hypothesised that the induction of challenge would lead to enhanced performance relative to the induction of threat in the presence of stereotype threat, but not in the absence of stereotype threat; their results were consistent with this hypothesis.

However, one can question the extent to which Alter et al.'s (2010) manipulation of motivational state actually influenced the extent to which participants were induced to experience challenge or threat. That is, it is possible that the manipulation did not have the intended effect on participants' motivational state. In Alter et al.'s (2010) challenge and threat conditions, participants were told that the forthcoming task would be a learning opportunity or a test of ability, respectively. However, to my knowledge there is only limited

² In terms of nomenclature, an unfortunate feature of the academic literature is that “threat” as per the biopsychosocial model (Blascovich, 2008) and “stereotype threat” are similar and easily-confused terms. For clarity, the current thesis will only ever use the word “threat” in the absence of the directly preceding word “stereotype” or “Multi” in cases where the construct of threat as per the biopsychosocial model is the point of reference. Similarly, the word “challenge” will only ever be used to communicate the concept of “challenge” as per the biopsychosocial model unless a different meaning is contextually obvious (e.g. “X evidence challenges hypothesis Y”).

and indirect evidence linking perceptions of a task's ability diagnosticity or learning-enhancing qualities to experiences of challenge or threat, namely a study showing that ability-diagnostic instructions led to an attentional bias that is typical of threat states, but not exclusive thereto (Putwain et al., 2011). In fact, other studies of stereotype threat (e.g. Steele & Aronson, 1995) have also manipulated the task's description as an ability measure or as a learning opportunity, but none of these studies interpreted this manipulation as a manipulation of motivational state in the way that Alter et al. (2010) did. Indeed, evidence shows that people can view a task as a challenge even if they perceive it to be ability diagnostic (Chalabaev, Major, Cury & Salazin, 2009), which suggests that Alter et al. (2010) may not have successfully induced threat by stressing that their task was ability diagnostic. As such, the available evidence pertaining to the modulation of the effects of stereotype threat and stereotype lift by motivational state remains limited. The experiments presented in chapter 2 will therefore seek to shed light on this subject.

Implicit theories about the nature of ability

Implicit theories about the nature of ability have been found to have important motivational consequences in a wide range of performance settings (Dweck, 1999; Molden & Dweck, 2006). According to the theoretical framework proposed by Dweck and Leggett (1988), individuals vary continuously on an entity-increment dimension. Entity theorists view ability as a stable construct that is primarily a matter of natural talent and largely unamenable to change. Increment theorists view ability as a variable construct that can be altered and improved through learning and the application of effort (Dweck, Chiu & Hong, 1995). Although this increment-entity distinction is typically studied in terms of beliefs about the nature of ability, there is evidence that people's views on the stability or malleability of personality also have important consequences. For instance, Levontin, Halperin and Dweck (2013) found that Israelis who were induced to view personality as a relatively malleable (as opposed to fixed) construct were subsequently to view the perceived

negative behaviour of Arabs as more amenable to change and consequently expressed more tolerant attitudes towards Arabs and more willingness to compromise for peace.

Implicit theories of ability have been found to influence responses to failure. Entity theorists are more likely to attribute personal failure to a deficiency in ability, whereas increment theorists are more likely to attribute failure to insufficient effort or practice (Hong, Chiu, Dweck, Lin & Wan, 1999). Consequently, increment theorists tend to respond to failure by increasing effort, whereas entity theorists respond by withdrawing effort (the utility of which is perceived to be negligible given low ability; Grant & Dweck, 2003; Molden & Dweck, 2006). As a result, increment theorists tend to display superior performance relative to entity theorists following the experience of failure or difficulty (Blackwell, Trzesniewski & Dweck, 2005; Mangels, Butterfield, Lamb, Good & Dweck, 2006). Entity theorists also respond to failure with more negative affect, because they perceive its underlying cause (low ability) to be less amenable to change (Grant & Dweck, 2003).

Why might implicit theories of ability moderate the effects of stereotype threat?

There is reason to believe that implicit theories of ability may moderate the effects of stereotype threat. Specifically, stereotype threat arises when the individual experiences anxiety over the prospect of demonstrating low ability (Chalabaev, Sarrazin, Stone & Cury, 2008; Smith, 2006). Thus, both stereotype threat and stereotype lift arise from ability-related concerns. It follows that increment theorists, who tend to be less concerned about demonstrating high ability or avoiding displays of low ability (Dweck & Leggett, 1988), should be less susceptible to the effects of both stereotype lift and stereotype threat compared to entity theorists.

A number of studies have provided confirmation for this line of reasoning. Aronson (1999) found that the negative effects of stereotype threat on performance are greater for entity theorists compared to increment theorists. Aronson et al. (2002) found that an intervention designed to encourage students to adopt an increment theory improved the

academic performance of African Americans (who frequently experience stereotype threat; Steele, 1997; Keller, 2012) relative to whites. Mendoza-Denton et al. (2008) found that men and Asian Americans performed better on a maths test when induced to hold an entity (rather than increment) theory of ability. However, this was only true when participants were exposed to a positive maths-related ingroup stereotype (men/Asians are good at maths), but not when the test instructions explicitly challenged the positive stereotype. Finally, Froehlich, Martiny, Deaux, Goetz and Mok (2016) found that individuals who were entity theorists by disposition were more susceptible to the effects of stereotype threat on performance than individuals who were increment theorists by disposition. Thus, the available evidence is consistent with the view that increment theorists are less sensitive to the effects of stereotype lift and stereotype threat on performance.

However, several limitations in these studies indicate a need for further research on the moderating role of implicit theories of ability. For instance, Aronson's (1999) study measured, but did not manipulate, implicit theories of intelligence, which precludes causal inference on the basis of their results. Similarly, Aronson, Fried and Good (2002) did not manipulate stereotype threat, but rather based their conclusions on a comparison of black participants (who were assumed to experience high levels of stereotype threat) and white participants (who were assumed to experience low levels of stereotype threat). The reduction of the black-white performance difference produced by their increment-belief intervention may therefore have been the result of an interaction between implicit theories and a race-related factor other than stereotype threat. Similarly, Froehlich et al. (2016) used a measure – rather than a manipulation – of implicit theories of ability, meaning that causal inferences about the role of this variable cannot definitively be made on the basis of their results. Moreover, although Mendoza-Denton et al. (2008) found that entity theorists outperformed increment theorists in the presence (but not the absence) of stereotype lift, they did not find a similar interaction with respect to stereotype threat. Thus, the modulation of the effects of stereotype threat by implicit theories of ability is a topic that requires further research.

Nevertheless, there is some evidence that the detrimental impact of stereotype threat on task performance can be eliminated by inducing people to hold an increment (rather than entity) theory of ability. Thus, general research question 3 – which will be addressed in chapter 3 – predicted that the effects of stereotype threat would be moderated by people’s implicit theories about the nature of the stereotyped ability. Chapter 3 focused on a dependent variable that has not hitherto been examined in the stereotype threat literature, namely belief in Anthropogenic Global Warming (AGW). Moreover, chapter 3 also explored a range of additional proposals pertaining to the moderation of the effects of stereotype threat on belief in AGW. However, because the reasoning underlying these additional proposals relates uniquely to belief in AGW as a dependent variable (that is, it cannot be generalised to make predictions about the effects of stereotype threat on other variables), it will be outlined in chapter 3 rather than the current chapter.

Public and Private Self-Consciousness

Public self-consciousness is the dispositional tendency to attend to aspects of the self that are subject to public observation (e.g. one’s appearance). Private self-consciousness is the dispositional tendency to attend to internal thoughts, feelings and sensations (Fenigstein, Scheier & Buss, 1975). Public and private self-consciousness have been linked to a range of variables relating to people’s perceptions of themselves, and to the ways in which people manage the impressions that they create on others (Mohiyeddini, Bauer & Semple, 2013; Sawaoka, Barnes, Blomquist Masheb & Grilo, 2012). For example, individuals who are high in public self-consciousness are more likely to seek high numbers of Facebook friends as a means of compensating for low self-esteem (Lee, Moore, Park & Park, 2012), to conceal gender-atypical sexual preferences (Pachankis & Bernstein, 2012), to experience shyness (Tabata, 2009), to be concerned about their weight (Sawaoka et al., 2012), and to adjust alcohol consumption in line with perceived social norms (Crawford & Novak, 2007). Private self-consciousness is associated with more accurate and elaborate knowledge of the self (Trapnell & Campbell, 1999), greater congruency between attitudes

and values (Kimmelmeier, 2001), and a tendency to attend to and categorise one's own internal thoughts (Harrington, Loffredo & Perz, 2014).

Why might Public Self-Consciousness interact with stereotype threat? Since stereotype threat often involves impression management concerns (Brown & Pinel, 2003), there is reason to believe that some of its effects might vary as a function of public self-consciousness. Individuals experiencing stereotype threat often attempt to disguise their distress in order to avoid displaying a lack of confidence to observers (Johns et al., 2008; Von Hippel et al., 2005), and publicly self-conscious individuals use similar strategies to facilitate effective impression management (Mohiyeddini et al., 2013). Since this suppression of emotional expression under stereotype threat is proposed to partially underlie the performance deficits that it induces (Johns et al., 2008; Schmader et al., 2008), it is reasonable to speculate that individuals who are high (vs. low) in public self-consciousness may be particularly prone to suppressing their emotions under stereotype threat, and that they consequently may be more likely to experience performance impairments when exposed thereto. Moreover, choking under pressure is sometimes induced via manipulations to which individuals high and low in public self-consciousness are known to be differentially sensitive (e.g. the presence of an audience; Geukes, Mesagno, Hanrahan & Kellman, 2012). Given the numerous similarities between choking under pressure and stereotype threat, this indicates that public self-consciousness may also moderate the effects of stereotype threat.

However, according to Shaprio and Neuberg's (2007) multi-threat framework, stereotype threat may sometimes be experienced independently of impression management concerns: self-as-source stereotype is proposed to arise when the individual experiences anxiety over the prospect of confirming the validity of the negative stereotype within their own mind (Inzlicht & Ben-Zeev, 2003). This contrasts with other-as-source stereotype threat, where the individual experiences anxiety over the prospect of confirming the negative stereotype from the perspective of other people. Given that only other-as-source stereotype threat, but not self-as-source stereotype threat, derives from outward impression

management concerns (Shapiro, 2011), it is possible that the role played by public self-consciousness in the context of stereotype threat differs as a function of whether the stereotype threat in question is of the self-as-source or other-as-source variety.

Following this reasoning, the trait activation principle (Tett & Guterman, 2000) can be used to formulate hypotheses about the possible interaction between stereotype threat source on the one hand and public and private self-consciousness on the other. The trait activation principle proposes that dispositional traits only exert an influence on cognition, affect and behaviour in trait-relevant situations. For instance, dispositional anxiety may only lead to anxiety-related cognitions, affective responses and behaviours in situations in which the individual perceives a significant possibility of physical or emotional harm (Tett, Simonet, Walser & Brown, 2013). In this regard, the different types of stereotype threat described by the Multi-Threat Framework (Shapiro & Neuberg, 2007) can be viewed as differentially relevant to public and private self-consciousness. Specifically, situations that evoke other-as-source stereotype threat can be classified as relevant to public self-consciousness, because other-as-source stereotype threat and public self-consciousness both derive from outward impression management concerns. Conversely, situations that evoke self-as-source stereotype threat cannot be viewed as relevant to public self-consciousness because they do not involve impression management concerns. It follows from the trait activation principle that public self-consciousness should predict important outcome variables pertaining to thought and behaviour in the context of other-as-source stereotype threat, but not in the context of self-as-source stereotype threat.

The trait activation principle can also be applied to develop a hypothesis about the potential interaction between private self-consciousness and stereotype threat source. Situations that evoke self-as-source stereotype threat can be viewed as relevant to private self-consciousness, because both self-as-source stereotype threat and private self-consciousness pertain to the way individuals perceive themselves (Trapnell & Campbell, 1999; Shapiro & Neuberg, 2007). However, private self-consciousness is unlikely to be

relevant to situations in which other-as-source stereotype threat is triggered, because other-as-source stereotype threat activates concerns about the way in which the self is being perceived by others, whereas private self-consciousness pertains to the individual's private self-perception. Based on the trait activation principle (Tett & Gutterman, 2000), it follows that private self-consciousness would only be expected to influence cognition, affect and behaviour in the context of self-as-source stereotype threat, but not in the context of other-as-source stereotype threat. In general research question 4, I therefore propose interactions between type of stereotype threat (self-as-source vs. other-as-source) and public self-consciousness and between type of stereotype threat and private self-consciousness.

Public and Private Self-Awareness

Public and private self-awareness refer to the state versions of the traits known as public self-consciousness and private self-consciousness, respectively. Public self-awareness therefore refers to the extent to which an individual is attending to publicly observable aspects of the self in a given situation, and private self-awareness refers to the extent to which an individual is attending to their internal thoughts, feelings and sensations in a given situation (Govern & Marsch, 2001). Public and private self-awareness are two independent constructs (Postmes, Spears & Lea, 2002).

Why might public and private self-awareness interact with stereotype threat? As noted above, there is evidence that stereotype threat impairs performance on motor tasks by inducing people to consciously monitor their own motor output (Beilock et al., 2006; Schmader et al., 2008; the same is also true of choking under pressure; Beilock et al., 2002). It is argued that this conscious monitoring hampers the automated motor programs that normally guide motor behaviour, thereby producing performance decrements (Schmader et al., 2008).

However, evidence indicates that monitoring one's own motor output only harms performance in some cases, whilst in other cases it may in fact enhance performance. Specifically, numerous studies (Abdollahipour, Wulf, Psotta & Palomo Nieto, 2015; Duke,

Cash & Allen, 2011; Poolton, Maxwell, Masters & Raab, 2006; Wulf & Su, 2007) have found that when people monitor their own motor output by attending to the effects of their actions on their external environment (external attention), performance is enhanced. Conversely, when people monitor their own motor output by attending to the internal sensations they produce (internal attention), performance is impaired (Wulf, 2013). For example, when balancing on an unstable object, people are more likely to fall if they are instructed to attend to the sensations in their feet (internal attention) rather than on the position of the unstable object (external attention; Wulf, Hoss & Prinz, 1998).

I will argue that when an individual is induced to monitor their own motor output (by, for example, being subject to stereotype threat; Schmader et al., 2008), the manner in which this monitoring is undertaken is likely to vary as a function of the individual's self-awareness. Specifically, when an individual in a privately self-aware state is induced to monitor his or her motor output, he/she would be likely to undertake this monitoring by focusing on the internal sensations produced by their actions (internal attention), because private self-awareness involves attending to internal thoughts, feeling and sensations (Govern & Marsch, 2001). Conversely, because public self-awareness involves focusing on the aspects of the self that are visible to others (Govern & Marsch, 2001), it follows that when monitoring their own motor output, individuals in a publicly self-aware state would direct their attention to the aspects of their actions that are visible to others, namely their external effects (resulting in external attention).

Since external and internal attention have positive and inimical effects on motor performance, respectively (Wulf, 2013), it follows that when individuals are induced to monitor their own motor output (e.g. when they are subject to high stereotype threat), high public self-awareness would be expected to be conducive to performance whereas high private self-awareness would be expected to be detrimental to performance. However, if the individual is not induced to monitor their own motor output (e.g. in the absence of stereotype threat), then clearly their degree of public or private self-awareness would not be able to

influence the manner in which they would engage such self-monitoring, because no such self-monitoring would be occurring in the first place. Individuals in a privately self-aware state would still focus on private aspects of the self (e.g. their internal emotional state), but they would have no reason to attend specifically to the internal sensations associated with their motor output. Likewise, individuals in a publicly self-aware state would still focus on public aspects of the self (e.g. their appearance), but they would have no reason to attend specifically to the effects of actions. Consequently, public and private self-awareness would only be expected to affect motor performance in the context of situational factors (such as stereotype threat) that induce people to monitor their own motor output. On this basis, it was hypothesised that predominant public (vs. private) self-awareness would be associated with superior performance following exposure to stereotype threat, but not in the absence of stereotype threat. Note that although public and private self-awareness are distinct constructs, the predicted interaction pertained to *predominant* self-awareness. That is, it was predicted that people whose state was more publicly self-aware than privately self-aware would display enhanced performance relative to those whose state was more privately self-aware than publicly self-aware, but only under high (and not low) stereotype threat (general research question 5).³

In sum, this thesis will present evidence regarding five broad research questions. Firstly, the extent to which stereotype threat effects are moderated by regulatory focus (general research question 1) and motivational state (general research question 2) will be investigated in experiments 1-4 of chapter 2. Thirdly, the thesis will investigate whether the effects of stereotype threat are moderated by implicit theories of ability (general research question 3), as well as three other variables which will be discussed in more detail below, namely the perceived effectiveness of a strategy for coping with stereotype threat, the

³ The prediction was framed in this way for practical, rather than theoretical, reasons – it could be tested using a design that contained two self-awareness conditions (high public/low private vs. low public/high private) rather than four (low public/low private vs. low public/high private vs. high public/low private vs. high public/high private). Whilst the former design entailed methodological issues, the sample size requirements for the latter design were in excess of what was possible given the resources available for this project.

positive or negative framing of a question, and physical temperature. These issues will be elaborated upon and examined in experiments 5-10 of chapter 3. Fourthly, experiments 11-13 of chapter 4 will test whether the source of stereotype threat interacts with public and private self-consciousness and whether stereotype threat itself interacts with the type of self-awareness that a person is experiencing (general research questions 4 and 5).

Although the research questions to be addressed are diverse, their broad unifying theme is the focus on variables that moderate – or whose effects are moderated by – stereotype threat or stereotype lift. In so doing, the thesis aims to draw theoretical conclusions about the potential causal mechanisms through which stereotype threat and lift operate under different circumstances, and to provide insights into how real-world interventions can be used to harness the effects of stereotype threat and stereotype lift to generate desirable social outcomes.

In the following paragraphs, the hypotheses which will be tested in this thesis are summarised. The theoretical rationales for the predictions will be furnished in the individual empirical chapters. The purpose of summarising all hypotheses here is not their justification (which will be presented later) but to provide the reader with a comprehensive overview of all questions under investigation as a reference guide.

Summary of all Hypotheses

Hypothesis 1 was that exposure to stereotype lift would be associated with superior performance relative to exposure to stereotype threat when a promotion focus was induced, but that exposure to stereotype threat would be associated with superior performance relative to exposure to stereotype threat when a prevention focus was induced.

Hypothesis 2 was that exposure to stereotype lift would be associated with superior performance relative to exposure to stereotype threat when threat was induced, but that exposure to stereotype threat would be associated with superior performance relative to exposure to a stereotype lift when challenge was induced.

Hypothesis 3 was that exposure to high stereotype threat would cause increased belief in anthropogenic global warming (AGW) relative to low stereotype threat.

Hypothesis 4 was that exposure to high (vs. low) stereotype threat would cause increased belief in AGW among individuals induced to adopt an entity theory of scientific ability, but not among individuals induced to adopt an increment theory of scientific ability.

Hypothesis 5 was that the effect of high (vs. low) stereotype threat in enhancing belief in AGW would be greater for individuals who were induced to view expressing belief in AGW as an effective means to cope with stereotype threat compared to individuals who were not thusly induced.

Hypothesis 6 was that individuals exposed to high (vs. low) stereotype threat would donate more money to an organisation involved in promoting belief in AGW, and that this effect would be mediated by heightened belief in AGW among individuals exposed to high (vs. low) stereotype threat.

Hypothesis 7 was that the effect of high (vs. low) stereotype threat in enhancing donations to an organisation involved in promoting belief in AGW would be greater for individuals who were induced to view expressing belief in AGW as an effective means to cope with stereotype threat compared to individuals who were not thusly induced.

Hypothesis 7 also proposed that this interaction would be mediated by the interactive effect outlined in hypothesis 5.

Hypothesis 8 was that individuals exposed to a positively framed message about AGW would express more belief in AGW compared to individuals exposed to a negatively framed message.

Hypothesis 9 was that the effect of positively framed (vs. negative framed) messaging in enhancing belief in AGW would be greater among individuals exposed to high stereotype threat relative to those exposed to low stereotype threat.

Hypothesis 10 was that high temperatures would be associated with increased belief in AGW relative to low temperatures, but only among individuals subject to low stereotype threat and not among individuals subject to high stereotype threat.

Hypothesis 11 was that public self-consciousness would correlate positively with challenge perceptions among individuals subject to other-as-source stereotype threat, but not among individuals subject to self-as-source stereotype threat.

Hypothesis 12 was that private self-consciousness would correlate positively with challenge perceptions among individuals subject to self-as-source stereotype threat, but not among individuals subject to other-as-source stereotype threat.

Hypothesis 13 was that other-as-source stereotype threat would be associated with increased reported self-handicapping relative to self-as-source stereotype threat.

Hypothesis 14 was that public self-consciousness would be associated with increased reported self-handicapping among individuals subject to other-as-source stereotype threat, but not among individuals subject to self-as-source stereotype threat.

Hypothesis 15 was that public self-awareness would be associated with superior motor task performance under relative to private self-awareness among individuals subject to high stereotype threat, but not among individuals subject to low stereotype threat.

Chapter Two: Moderation of the effects of Stereotype Threat and Stereotype Lift by Regulatory Focus and Motivational State

As noted in the introduction, there is reason to expect that the effects of stereotype lift and stereotype threat are likely to be moderated by regulatory focus and motivational state. Research indicates that task performance is enhanced when two separate features of a situation encourage the adoption of the same regulatory focus (Keller & Bless, 2006; Maddox et al., 2006; Plessner et al., 2009; Shah et al., 1998; Renkema & Van Yperen, 2008; Worthy et al., 2009). In other words, performance is enhanced in situations where there are two factors inducing a promotion focus or two factors inducing a prevention focus, compared to situations in which one factor induces a promotion focus and another factor induces a prevention focus. Stereotype threat and stereotype lift induce the adoption of a prevention and promotion focus, respectively (Oyserman, Uskul, Yoder, Nesse & Williams, 2007; Seibt & Förster, 2004). Therefore, performance in situations that evoke stereotype threat should be enhanced when there is a separate situational factor inducing the adoption of a prevention (rather than a promotion) focus. Conversely, performance in situations that evoke stereotype lift should be enhanced when a separate situational factor induces the adoption of a promotion (rather than a prevention) focus.

A similar line of reasoning can be used to guide predictions about the moderation of stereotype lift and stereotype threat by motivational state (challenge vs. threat). An examination of the available evidence indicates that performance is enhanced when two situational factors or one situational and one dispositional factor induce different (rather than the same) motivational states. That is, when two features of a situation both induce challenge, or when two features of a situation both induce threat, performance is likely to be inferior compared to when one feature of a situation induces challenge whilst another induces threat (Drach-Zahavy & Erez, 2002; Feinberg & Aiello, 2010; Moore et al., 2015; Rosenthal & Crisp, 2007; Schmader et al., 2009). Stereotype lift and stereotype threat induce

challenge and threat states, respectively (Vick et al., 2008). Therefore, performance in situations that trigger stereotype lift should be enhanced when a separate situational factor induces threat (rather than challenge). Conversely, performance in situations that trigger stereotype threat should be enhanced when a separate situational factor induces challenge (rather than threat).

In chapter 1, I noted an apparent discrepancy in the results of studies that have examined interactions between manipulations of stereotype threat vs. stereotype lift and manipulations of regulatory focus. Grimm et al. (2009) randomly assigned participants to experience either stereotype lift or stereotype threat. Furthermore, some participants were presented with a gain/non-gain point system in the experimental task: correct responses resulted in points being gained, whereas incorrect responses failed to gain points. Other participants were presented with a loss/non-loss point system: incorrect responses resulted in point losses, whereas correct responses averted the loss of points. These different point systems have been found to induce promotion (gain/non-gain system) and prevention (loss/non-loss system) foci (Liberman et al., 1999). Consistent with the principle of regulatory fit, Grimm et al. (2009) found that performance was enhanced when stereotype threat was coupled with the loss/non-loss condition (two situational factors both inducing prevention foci) and when stereotype lift was coupled with the gain/non-gain condition (two situational factors both inducing promotion foci) relative to the other conditions. Grimm, Lewis, Maddox & Markman, (2016) replicated this finding using a different task.

However, Keller & Bless (2008; see also Keller, 2007) conducted a similar experiment to Grimm et al. (2009) and produced contradictory results. Keller & Bless (2008) assigned participants to experience either stereotype lift or stereotype threat. Some participants were completed with a gain/non-gain system (designed to induce a promotion focus) in the experimental task. Other participants were presented with a gain/loss point loss system, wherein correct responses gained points and incorrect responses lost points. Although this gain/loss system differed from Grimm et al.'s (2009) loss/non-loss system,

Keller and Bless (2008) nevertheless assumed that it would induce a prevention focus because it contained the possibility of losing points. In contrast to Grimm et al. (2009), Keller and Bless (2008) found that performance was enhanced when the gain/non-gain (promotion focus) point system was coupled with stereotype threat and when the gain/loss (prevention focus) point system was coupled with stereotype lift.

I propose that the apparent contradiction between Grimm et al.'s (2009) and Keller and Bless' (2008) findings can be resolved by considering the nature of the point systems used in each study, and the different ways in which regulatory focus and motivational state are likely to moderate the effects of stereotype lift and stereotype threat. Specifically, I will argue that Keller and Bless' (2008) point system manipulation, which differed from the one used by Grimm et al. (2008), would have manipulated motivational state, not regulatory focus. If correct, this would explain why Keller and Bless (2008) produced different results to Grimm et al. (2008).

Keller and Bless' (2008) promotion point system had a gain/non-gain structure (correct responses gained points; incorrect responses gained no points), and the prevention point system had a gain/loss structure (correct responses gained points; incorrect responses lost points). Thus, the range of possible scores spanned from 0 to the number of questions on the task (in the promotion condition) or from a positive to a negative value (in the prevention condition). Scales spanning from a negative to a positive value are likely to be interpreted by respondents as measuring both competence and incompetence, whereas scales spanning from 0 to a positive value are likely to be interpreted as solely measuring competence (Schwarz, Grayson, & Knäuper, 1998).

Therefore, participants in Keller and Bless' (2008) gain/non-gain condition might have viewed the task as designed to assess their competence, whereas participants in the gain/loss condition might have viewed the task as designed to assess their competence *or* incompetence. Moreover, tests that are perceived as measuring competence (but not incompetence) typically induce challenge, whereas tests that are perceived to measure

incompetence induce threat (Chalabaev et al., 2009). On this basis, one can infer that Keller and Bless' manipulation might have induced different motivational states, i.e. challenge vs. threat. In contrast, Grimm et al.'s (2009) point system manipulation included a target number of points to gain (or to not lose); participants were encouraged to aim to reach this target. Participants presumably used this point target (rather than the range of possible scores) as a reference to assess their performance (reaching the target implying high competence; failing to do so implying low competence). Thus, the promotion and prevention conditions would not have differed in terms of the extent to which participants saw the task as indicative of (in)competence, and therefore as a challenge or threat. Thus, one can conclude that Grimm et al. (2009) only manipulated promotion vs. prevention focus.

Given that performance is impaired when two factors induce the same motivational state, the fact that Keller and Bless (2008) may have manipulated motivational states would explain why they found impaired performance when positive stereotypes were paired with the gain/non-gain system (both factors induced challenge) and when negative stereotypes were paired with the gain/loss system (both factors induced threat). Conversely, Grimm et al.'s (2009) results accord with the principle of regulatory fit – performance was enhanced when the loss/non-loss system was paired with negative stereotypes (both induced prevention) and when the gain/non-gain system was paired with positive stereotypes (both induced promotion).

The experiments in Chapter 2 tested the accuracy of the proposed roles of motivational state and regulatory focus in moderating the effects of stereotype valence. In line with Grimm et al. (2009), it was hypothesised (hypothesis 1) that promotion coupled with stereotype lift and prevention coupled with stereotype threat would lead to better performance (compared to promotion/stereotype threat and prevention/stereotype lift). It was also hypothesised (hypothesis 2) that a challenge induction coupled with stereotype threat and a threat induction coupled with stereotype lift would lead to better performance (compared to challenge/stereotype lift and threat/stereotype threat). A first experiment aimed

to demonstrate that Keller and Bless' (2008) - but not Grimm et al.'s (2009) - manipulation would indeed affect a measure of motivational state. Experiment 2 then tested the interactive effects of regulatory focus and motivational state with stereotype valence on performance in one comprehensive design. Experiments 3 and 4 then attempted to replicate some of the results obtained in experiment 2.

Experiment 1

Experiment 1 was designed to test the hypothesis that the Keller and Bless' (2008) gain/non-gain point system would be associated with increased challenge and reduced threat relative to their gain/loss point system, whereas Grimm et al.'s (2009) gain/non-gain and loss/non-loss point system would not induce differences in motivational state.

Method

Participants

Participants were recruited using CrowdFlower. Overall, 255 completed responses were recorded, 16 of which were excluded for dual participation. Of the remaining 239 participants, 72 were female. Participants were compensated with \$.05.

Country of participation. Participants were situated a wide range of countries. This country distribution is difficult to characterise statistically; noteworthy features were the fact that no participants were located in East Asian countries other than three participants from Vietnam, that the most frequent participant locations were India (which provided 23 participants) and Serbia (which provided 22 participants) and that only 4 participants were located in African countries. The sample contained large numbers of participants from both developing and developed countries.

These patterns are broadly consistent with the geographical distribution of the samples in the other CrowdFlower experiments (aside from experiment 10, in which only Americans participated, and experiments 6-9, in which no Americans participated). As such, it has not been deemed necessary to provide details of the geographical distribution of

respondents for the CrowdFlower samples of all the experiments herein.

Design

_____A 4-condition between-subjects design was used, with point system as the independent variable and challenge perceptions as the dependent variable. Thus, participants were randomly assigned to the following four conditions: Grimm et al.'s (2009) gain/non-gain or loss/non-loss condition or Keller and Bless's (2008) challenge or threat condition.

Determining Sample Sizes

The current section is intended to explain the sample sizes used in all of the experiments of this thesis, not just experiment 1.

Several factors influenced the sample sizes that were selected across the experiments reported herein. In general, a minimum of 80% power to detect a medium effect size at a p-value threshold of .05 was required. Most of the experiments exceeded the requisite sample size for this criterion; exceptions were experiment 10 and 13, in which 98 and 80 participants were recruited, respectively (as opposed to the required 124 for the 2x2 between-subjects design). This was because experiment 10 was originally intended to be an exploratory experiment addressing a number of different outcome variables; most of these variables were irrelevant to the work of the current thesis and have therefore not been mentioned herein (see procedure of experiment 10). For experiment 13, in which participation occurred in-person, the low sample size was simply due to the practical difficulty of obtaining a sufficient number of participants.

Attention Check

An attention check was included in all of the online experiments of this thesis, including experiment 1. Participants were presented with a lengthy passage of text, followed by a short question ("what colour are your eyes?"). The passage of text instructed participants not to answer the question below, but rather to enter a code word (e.g. 'corn') in

the space provided. Participants who failed to enter the code word were unable to proceed to the experiment proper.

Procedure and measures

Participants were told about the point structure of a forthcoming test with 10 questions. Participants in both of the gain-based conditions (promotion and challenge) were told that they would gain points for correct answers, but not for incorrect answers. Those in the loss-based system that followed Keller & Bless (2008) were told that they would gain and lose points for correct and incorrect answers, respectively (threat), whilst those in the loss-based system that followed Grimm et al. (2009) were told that they would lose and not lose points for incorrect and correct answers, respectively (prevention). Participants in both of the conditions that followed Grimm et al. were also told that they would start with 0 points and that they should try to gain at least 6 points (lose no more than 4 points) out of 10.

Participants' perceptions of challenge and threat regarding the upcoming task were assessed with a single item on a 7-point scale (1 = *I see it as a threat*; 7 = *I see it as a challenge*). Similar items have been used to assess challenge and threat evaluations in previous studies (e.g., Chalabaev et al., 2009). The assessment of challenge and threat with only one item is consistent with the conceptualisation of challenge-threat as a unidimensional variable, such that high challenge necessarily implies low threat and high threat necessarily implies low challenge (Blascovich et al., 2003). Also, the usage of a single-item measure is appropriate if the measured construct is singular within the mind of the individual (Bergkvist & Rossiter, 2007). The materials used in experiment 1 are presented in Appendix A.

Results and Discussion

A one-way analysis of variance (ANOVA) on participants' self-reported challenge was conducted, with the point systems as four levels of the independent factor. This yielded a significant effect, $F(3, 235)=3.481, p=.017, \eta_p^2=.04$. Pairwise comparisons revealed that,

as expected, the mean perceived challenge did not differ between the promotion and prevention conditions based on Grimm et al.'s (2009) manipulations ($p=.59$), but did differ between the two conditions based on Keller & Bless (2008) ($p=.02$), supporting the prediction that this manipulation would induce differences in motivational state. Moreover, a planned contrast revealed that perceptions of challenge were increased in the gain/non gain condition based on Keller and Bless (2008) compared to all other conditions: $t(235)=3.18$; $p=.002$. Means and standard deviations are displayed in Table 1.

Table 1

Challenge as a Function of Point System in Experiment 1

Point System			
Promotion (gain/non-gain point system with a point target)	Prevention (loss/non-loss point system with a point target)	Challenge (gain/non-gain point system with no point target)	Threat (gain/loss point system with no point target)
5.08 (1.42)	5.22 (1.57)	5.85 (1.30)	5.16 (1.69)

Note. Standard deviations in parentheses.

In sum, these findings support the idea that Grimm et al.'s (2009) manipulation did not tap into motivational states of challenge or threat, while Keller and Bless' (2008) manipulation did. Having substantiated this important assumption, a further experiment was conducted to test hypotheses 1 and 2 in an attempt to replicate both Grimm et al.'s (2009) and Keller and Bless' (2008) findings.

Experiment 2

Having established that the two types of manipulations do indeed exert differential effects on motivational state, I next tested the hypotheses that a promotion (vs. prevention) focus would enhance performance in the context of stereotype lift and impair performance in the context of a stereotype threat (hypothesis 1), whereas challenge (vs. threat) would impair performance in the context of a stereotype lift and enhance performance in the context of stereotype threat (hypothesis 2).

Therefore, a manipulation of stereotype valence (stereotype lift vs. stereotype threat) was crossed with the four levels of the point system manipulation used in experiment 1. Participants' performance on a cognitively demanding task was then assessed.

Method

Participants and design

Participants were recruited using the CrowdFlower online data collection platform and were compensated with \$0.10 – 0.20 for participation. Overall, 562 completed responses were recorded; 218 of these were excluded for dual participation. Of the 344 remaining participants 94 were female. Participants were randomly assigned to conditions in a 2 (stereotype valence positive vs. negative) x 4 (type of manipulation: promotion vs. prevention vs. challenge vs. threat) design.⁴ The dependent variable was performance on a cognitively demanding task that was presented as a test of reasoning ability.

Procedure and Measures

Type of Manipulation. Participants were informed that they would complete a task measuring 'reasoning ability'. The descriptions of the point system were identical to in experiment 1, except for participants in the promotion and prevention conditions being told that there would be 20 questions. Moreover, participants in the promotion (prevention) conditions were advised to aim to gain (lose) at least (no more than) 14 (6) points. Participants in the challenge and threat conditions were told that there would be 20 questions but were not given a point target.

Stereotype Valence. Following the point system instructions, participants were informed that either their own gender (positive valence) or the opposite gender (negative

⁴ Due to a technical error and an error in planning the participant recruitment, participants were not all recruited in one batch and random assignment to conditions was not perfect. This should be borne in mind when interpreting the results of experiment 2.

valence) tended to perform better on the forthcoming test.

Test Performance. Participants completed a task containing 20 questions that primarily involved the detection of spatial or mathematical patterns and mathematical reasoning. An example question was: “There were 100 people present at a baseball card show, 59 wore glasses, 72 were baseball card collectors. What is the lowest possible number of people at the show who wore glasses AND collected baseball cards?” Questions were in a multiple choice format, with the number of responses available for each question ranging from 5 to 9. Correct answers to any question gained 1 point; incorrect responses lost $1/(n-1)$ points, where n is the number of responses available for that question. Participants lost no points for leaving a question blank. This system corrects for guessing.⁵ Note that this was the system used to calculate participants’ scores for the purposes of statistical analysis and was independent of the way in which participants were *told* their scores would be computed (which, as specified above, varied across conditions). The materials used in experiment 2 are presented in Appendix B.

Results and Discussion

A 2 (stereotype valence) x 4 (type of manipulation) ANOVA on participants’ test performance score was conducted. Neither of the two main effects were significant (stereotype valence $F < 1$; type of manipulation $F(3,336) = 1.39, p = .25$).

As hypothesised, the interaction between the two factors was significant, $F(3,336) = 4.39, p = .005, \eta_p^2 = .04$. Analyses of the simple effect of stereotype valence were conducted for each of the manipulation types. Consistent with hypothesis 1, stereotype lift was associated with marginally significantly superior performance relative to stereotype threat in the promotion condition: $F(1,336) = 3.35; p = .07; \eta_p^2 = .01$. Further supporting hypothesis 1, stereotype threat was associated with superior performance relative to stereotype lift in the

⁵ In experiments 2 and 4, a series of self-report questions were asked at the end of the test (e.g. “how much effort did you make during the test?”) for purely exploratory purposes. These were not relevant to the hypotheses under discussion and have therefore not been mentioned.

prevention condition: $F(1,336)=5.23$; $p=.02$; $\eta_p^2=.02$. Consistent with hypothesis 2, stereotype threat was associated with marginally superior performance relative to stereotype lift in the challenge conditions: $F(1,336)=2.83$; $p=.09$; $\eta_p^2=.01$. The direction of the stereotype valence effect in the threat conditions - with stereotype lift associated with superior performance relative to stereotype threat - was also consistent with hypothesis 2, but did not reach significance: $F(1,336)=1.96$; $p=.16$; $\eta_p^2=.01$. Means and standard deviations are displayed in Table 2.

Table 2

Performance as a Function of Stereotype Valence and Type of Manipulation in Experiment 2

		Type of Manipulation			
		Promotion	Prevention	Challenge	Threat
Stereotype Valence	Stereotype Lift	5.63 (3.05)	4.11 (3.30)	3.37 (2.72)	5.19 (3.37)
	Stereotype Threat	4.36 (3.34)	5.64 (3.48)	4.66 (3.60)	4.09 (3.59)

Note. Standard deviations in parentheses.

Experiment 3

Experiment 3 sought to test part of hypothesis 1 in a real-world (rather than online) setting, in order to establish the replicability and generalisability of the effect. Since participant recruitment is often more time consuming in real-world settings, to keep requirements for sample size at a reasonable level experiment 3 focused solely on the effects of manipulating stereotype lift vs. stereotype threat when Grimm et al.'s (2009) gain/non-gain (promotion focus inducing) point system was used. In line with the rationale of hypothesis 1, it was predicted that performance would be superior in the stereotype lift condition (where the point system and stereotype lift would both induce a promotion focus)

compared to the stereotype threat condition (where the point system would induce a promotion focus whilst stereotype threat would induce a prevention focus).

Method

Participants and Design

86 participants (20 males) were either paid £3 or granted course credit as part of their Psychology degree at Royal Holloway University. Data from three participants could not be included because of a computer error.

A 2-condition between-subjects design was used, in which stereotype valence (stereotype threat vs. stereotype lift) was the independent variable and performance on the test of reasoning ability was the dependent variable.

Procedure

The same procedure employed in experiment 2 was used in experiment 3, except for the fact that the task point system was not manipulated – Grimm et al.'s (2009) gain/non-gain point system was used for all participants.⁶

Results and Discussion

Consistent with Grimm et al.'s (2009) results and in accordance with hypothesis 1, performance on a cognitively demanding task was superior in the stereotype lift condition ($M=8.76$, $SD=2.78$) relative to the stereotype threat condition ($M=6.64$, $SD=3.37$), $F(1,81)=9.86$; $p=.002$; $\eta_p^2=.11$. This lends further support to the prediction that regulatory focus is an important moderator of the effects of stereotype threat.

⁶ After the test of experiment 3, participants completed a reaction-time task designed to assess the extent to which they were biased to attend to their own name relative to other words. Although the data generated from this task were interesting and consistent with the predictions that they were designed to test, they are not relevant to the current work and have therefore not been discussed.

Experiment 4

Experiment 4 sought to test the proposed modulatory roles of regulatory focus and motivational state (as per hypotheses 1 and 2) using different manipulations of these variables to those used in experiments 2 and 3.

I adapted a commonly used manipulation of regulatory focus (the “mouse in the maze” task; Friedman & Förster, 2005) for this purpose. In the “mouse in the maze” task, participants are asked to help a mouse navigate its way out of a maze. In the promotion condition, a piece of cheese is depicted outside the maze; participants are told to help the mouse obtain it. In the prevention condition, an owl is depicted flying above the maze; participants are told to help the mouse escape it.

However, the adaptation that was made to this task in experiment 4 was such that the induction of promotion and prevention foci was not achieved purely through the owl vs. cheese manipulation used in previous studies (Scholer & Higgins, 2008). Rather, as will be explained below, there was one “owl” condition that induced a prevention focus and a second “owl” condition that induced a promotion focus; there was likewise one “cheese” condition that induced a promotion focus and one “cheese” condition that induced a prevention focus. Similarly, one of the “owl” conditions and one of the “cheese” conditions was designed to induce challenge whilst another of the “owl” conditions and another of the “cheese” conditions was designed to induce threat.

Rather than solving a maze, participants simply saw a picture thereof, with either an owl hovering above or a piece of cheese placed outside (as with the original manipulation; Friedman & Förster, 2005). To manipulate motivational states, half of the participants read a passage of text beneath the picture describing how the mouse was longingly anticipating the prospect of successfully achieving his goal (i.e. the prospect of successfully obtaining the cheese or the prospect of successfully avoiding being eaten). The other participants read a passage of text describing how the mouse was dreading the prospect of failing to achieve his

goal (i.e. the prospect of remaining hungry after failing to obtain the cheese or the prospect of being eaten by the owl). Thus, four conditions were created by crossing a “success vs. failure” manipulation with a “cheese vs. owl” manipulation. I reasoned that the “success vs. failure” manipulation would induce challenge and threat states, respectively. Cues that heighten the accessibility of end-states associated with success and failure have been found to induce challenge and threat states, respectively (McTeague, Lang, Laplante, Cuthbert, Strauss & Bradley, 2009; Weisbuch-Remington, Mendes, Seery & Blascovich, 2005; Williams, Cumming & Balanos, 2010). Indeed, cognitive representations of likely events are more accessible than those of unlikely events (Tversky & Kahneman, 1974; Förster, Liberman & Higgins, 2005), and the belief that success (failure) is likely is associated with challenge (threat) states (Putwain & Symes, 2014). Thus, evidence indicates that increasing the accessibility of end-states associated with success and failure induces challenge and threat, respectively. In experiment 4, I therefore reasoned that participants who read the passage in which the mouse was focused on the prospect of success (failure) would be induced to experience challenge (threat).

I also expected participants in the different conditions to vary in terms of regulatory focus. Evidence shows that individuals who are induced to think about failures to achieve promotion or prevention goals (such as obtaining nourishment or avoiding death; Higgins, 2002, 2005) become more prevention or promotion focused, respectively; individuals who are induced to think about successes in achieving promotion or prevention goals become more promotion or prevention focused, respectively (Higgins et al., 2001). In other words, thinking about the prospect of failing to achieve a given goal induces the opposite regulatory focus to that contained within the goal, whereas thinking about the prospect of successfully achieving a given goal induces the same regulatory focus as that contained within the goal (Higgins et al., 2001; Higgins, 2005).

Thus, reading about the mouse’s anticipated failure in attaining the cheese (cheese/failure condition) would involve focusing on the prospect of failing to achieve a

promotion goal, which would lead to a prevention focus. Reading about the mouse's anticipated success in attaining the cheese (cheese/success condition) would involve focusing on the prospect of successfully achieving a promotion goal, which would lead to an increased promotion focus. Reading about the mouse's anticipated failure in escaping the owl (owl/failure condition) would involve focusing on the prospect of failing to achieve a prevention goal, which would lead to a reduced prevention focus. Reading about the mouse's anticipated success in escaping the owl (owl/success condition) would involve focusing on the prospect of successfully achieving a prevention goal, which would lead to an increased prevention focus. Therefore, participants in the cheese/success and owl/failure conditions would be predominantly promotion focused relative to participants in the cheese/failure and owl/success conditions. Thus, in the following sections the term "prevention focus conditions" refers to the owl/success and cheese/failure conditions (wherein participants were induced to be prevention focused), whilst the term "promotion focus conditions" refers to the owl/failure and cheese/success conditions (wherein participants were induced to be promotion focused).

After reading the passage of text about the mouse, participants were told that they were about to complete a test of reasoning ability and were subject to the same manipulation of stereotype lift vs. stereotype threat used in experiments 2 and 3. In the stereotype lift (threat) condition, participants were told that members of their gender tended to exhibit superior (inferior) performance on the forthcoming task.

In accordance with hypothesis 1, it was predicted that stereotype lift would be associated with superior performance relative to stereotype threat in the promotion conditions but that stereotype threat would be associated with superior performance relative to stereotype lift in the prevention conditions.

In accordance with hypothesis 2, it was predicted that stereotype threat would be associated with superior performance relative to stereotype lift in the challenge conditions (i.e. the cheese/success and owl/success conditions), but that stereotype lift would be

associated with superior performance relative to stereotype threat in the threat conditions (i.e. the cheese/failure and owl/failure conditions).

Method

Participants and Design

222 participants were recruited via CrowdFlower, of whom 34 were excluded for dual participation. This left 141 males and 47 females. A 2 (stereotype valence: stereotype lift vs. stereotype threat) x 4 (maze condition: cheese/success, cheese/failure, owl/success, owl/failure) between-subjects experimental design was used, with test performance as the dependent variable. Note that the analyses performed on the data for experiment 2 did not treat each maze condition as a separate level of an independent variable; rather, two separate analyses were conducted, each of which involved collapsing the 4 maze conditions onto a 2-level regulatory focus factor or a 2-level motivational state factor. Thus, the data were analysed with two 2x2 between-subjects designs; in one of these, stereotype valence (stereotype threat vs. stereotype lift) and regulatory focus (promotion vs. prevention) were the independent variables; in the other, stereotype valence (stereotype threat vs. stereotype lift) and motivational state (challenge vs. threat) were the independent variables. In both cases, performance on the reasoning test was the dependent variable.

Procedure

Participants were first subject to the regulatory focus and motivational state manipulations described above, before being told that they were about to complete a test of reasoning ability on which their gender tended to exhibit superior (stereotype lift condition) or inferior (stereotype threat condition) performance. No information was given about how the task would be scored. The reasoning task used to assess performance was the same as the one used in experiments 2 and 3. The materials used in experiment 4 – other than those taken from previous experiments – are presented in Appendix C.

Results and Discussion

A 2x2 ANOVA was conducted, using Stereotype Valence (Positive vs. Negative) and Regulatory Focus as independent variables, with Score as the dependent variable. Neither of the main effects were significant: both $F_s < 1$. Consistent with hypothesis 1, there was a significant interaction between Stereotype Valence and Regulatory Focus: $F(1,184)=4.11$; $p=.04$; $\eta_p^2=.02$ (see Table 3). Again consistent with hypothesis 1, stereotype threat was associated with significantly superior performance relative to stereotype lift when a prevention focus was induced: $F(1,184)=4.21$; $p=.04$; $\eta_p^2=.02$. However, stereotype lift was associated with only non-significantly superior performance relative to stereotype threat when a promotion focus was induced: $F(1,184)=.69$; $p=.41$; $\eta_p^2=.00$.

Table 3

Scores as a function of Stereotype Valence and Regulatory Focus in experiment 3

		Stereotype Valence	
		Stereotype Lift	Stereotype Threat
Regulatory Focus	Promotion	4.79(3.73)	4.21(3.38)
	Prevention	4.16(3.23)	5.58(3.19)

Note: Standard Deviations in Parenthesis

A second 2x2 ANOVA was conducted, using Stereotype Valence (stereotype lift vs. stereotype threat) and Motivational State (challenge vs. threat) as independent variables and score as a dependent variable. Consistent with hypothesis 2, the interaction was marginally significant: $F(1,184)=3.17$; $p=.08$; $\eta_p^2=.02$ (see Table 4). Further supporting hypothesis 2, negative stereotypes were associated with higher scores than positive stereotypes in the challenge conditions to a marginally significant degree: $F(1,184)=3.50$; $p=.06$; $\eta_p^2=.02$. However, positive stereotypes were associated with only non-significantly higher scores than negative stereotypes in the threat conditions: $F(1,184)=.45$; $p=.50$; $\eta_p^2=.00$.

Table 4

Scores as a function of Stereotype Valence and Motivational State in experiment 4

		Stereotype Valence	
		Stereotype Lift	Stereotype Threat
Motivational State	Challenge	4.26(3.66)	5.55(3.27)
	Threat	4.70(3.30)	4.22(3.32)

Note: Standard Deviations in Parenthesis

Overall, the results of experiment 4 were broadly consistent with the predictions derived from hypotheses 1 and 2. The patterns of mean differences that I predicted on the basis of these two statistical interactions were largely reflected in the observed data: all the simple effects of stereotype valence were all in the hypothesised direction for each level of motivation state and regulatory focus, although in two cases these simple effects were not significant.

General Discussion

The experiments presented in chapter 2 are consistent with the proposed modulation of the effects of stereotype threat and stereotype lift by regulatory focus and motivational state. Experiment 1 indicated that the point system manipulation employed by Keller and Bless (2008; see also Keller, 2007) induced challenge (in the gain/non-gain condition) and threat (in the gain/loss condition). However, Grimm et al.'s (2009) similar manipulation did not affect motivational state. Since previous studies (Lieberman et al., 1999; Maddox et al., 2006; Renkema & Van Yperen, 2008; Worthy et al., 2009) have shown that Grimm et al.'s (2009) point system would have influenced regulatory focus, the results of experiment 1 therefore offer a resolution to the apparent inconsistency between the results produced by Grimm et al. (2009) and Keller and Bless (2008). Grimm et al. (2009) found that stereotype lift enhanced performance relative to stereotype threat when a gain/non-gain (promotion focus inducing) point system was used, but impaired performance when a loss/non-loss

(prevention focus inducing) point system was used. Given that stereotype lift and stereotype threat induce promotion and prevention foci, respectively (Seibt & Förster, 2004), this result is consistent with hypothesis 1 regarding the modulation of stereotype threat and stereotype lift by regulatory focus.

Keller and Bless (2008) found that performance in the context of stereotype lift was enhanced when the (challenge inducing) gain/non-gain point system was used compared to when the (threat inducing) gain/loss point system was used. However, the opposite was true in the context of stereotype threat. This supports the proposal (hypothesis 2) that performance in the context of stereotype lift is impaired when challenge, rather than threat, is induced, whilst the opposite is true under stereotype threat.

Experiment 2 provided evidence in support of hypothesis 1 and 2 and reinforces my interpretation of Grimm et al.'s (2009) and Keller & Bless' (2008) results by showing that the reason for the apparent discrepancy in their findings lies in a subtle difference between the point system manipulations that they employed. As such, experiment 2 generated further evidence for the view that the induction of threat and a promotion focus enhances performance in the context of stereotype lift whilst the induction of challenge or a prevention focus enhances performance in the context of stereotype threat. Experiment 3 amassed further evidence in support of hypothesis 1 and reproduced some of the results of experiment 2. Finally, experiment 4 reproduced the proposed patterns of moderation by regulatory focus and motivational state using different manipulations thereof, although some of the predicted simple effects were not significant.

As well as being consistent with the results of both Grimm et al. (2009; Grimm et al., 2016) and Keller (2007; Keller & Bless, 2008), the current findings are consistent with a range of studies examining the relationship between stereotype threat and regulatory focus. For instance, Chalabaev, Major, Sarrazin and Cury (2012; see also Chalabaev, Dematte, Sarrazin & Fontayne, 2015) encouraged participants to focus on avoiding poor performance (which induces a prevention focus) or on striving for strong performance (which induces a

promotion focus; Renkema & Van Yperen, 2008; Brendl & Higgins, 1996). Participants who were subject to stereotype threat performed more strongly when a prevention (rather than promotion) focus was induced, whereas the opposite was true for participants subject to stereotype lift. Likewise, Deemer, Smith, Carroll and Carpenter (2014) found that people who were naturally inclined to seek to avoid poor performance performed more strongly under stereotype threat than people who were not inclined thusly. Thus, the current findings are consistent with previous research on the relationship between regulatory focus and stereotype threat (see also Ståhl, Van Laar & Ellemers, 2012).

Furthermore, the present results highlight the overlap between choking under pressure and stereotype threat. Worthy et al. (2009) and Plessner et al. (2009) both found that prevention foci are associated with superior performance in the context of high pressure, but not low pressure. This is consistent with the current experiments, which found the same effect of manipulating regulatory focus under stereotype threat. The present findings therefore contribute to the large literature documenting the similarities between stereotype threat and choking under pressure (Allen et al., 2002; Beilock et al., 2002; Beilock et al., 2006; Bellinger et al., 2015; Jamieson & Harkins, 2010; Mesagno et al., 2012; Vick et al., 2008; Weger et al., 2012).

Theoretical and Practical Implications

The current findings have important implications for research concerning the relationship between regulatory focus and motivational state. Some researchers (e.g. Seery, Weisbuch & Blascovich, 2009) have suggested that these two dimensions should not be regarded as separate: it is argued that challenge is equivalent to a promotion focus and that threat is equivalent to a prevention focus. The present experiments, however, conflict with these conclusions by indicating that inductions of challenge or a promotion focus (rather than of threat or a prevention focus, respectively) have different effects on performance in the context of stereotype threat and stereotype lift. This is consistent with research conducted by Sassenberg, Sassenrath and Fetterman (2015) suggesting that the attentional

effects of challenge and threat induction differ from the effects of manipulating promotion and prevention foci, respectively. Thus, the current research is consistent with the view that regulatory focus and motivational state are separate constructs.

At the practical level, the current findings have clear implications for strategies designed to ameliorate the potentially detrimental effects of positive or negative stereotypes on performance (Steele & Aronson, 1995; Rosenthal & Crisp, 2007). The finding that these effects can be modulated by manipulations of regulatory focus or motivational state indicates that their negative impact on real-world performance could be reversed through the application of fairly minor alterations of the performance situation. For example, the point system manipulations used in experiment 2 could easily be implemented in real-life performance situations in order to improve the performance of individuals who are at heightened risk of experiencing performance impairments due to stereotype threat (e.g. Keller, 2012).

Limitations

There are a number of limitations that apply to the experiments of chapter 2. Participants were always assigned to experience either stereotype threat or stereotype lift, with no control condition in which performance stereotypes were not mentioned. As such, it is impossible to infer the extent to which the impact of the stereotype manipulation was driven by the effect of stereotype lift, the effect of stereotype threat, or both. This limitation also applies to some of the previous studies in the same area (Grimm et al., 2009; Keller & Bless, study 1, although see Keller, 2007; Keller & Bless, 2008, study 2; Seibt & Förster, 2004). Increased usage of control conditions when studying the effects of both stereotype threat and stereotype lift would therefore be appropriate in future research. An additional limitation of the current findings is that experiments 2, 3 and 4 all used the same reasoning task to assess task performance. This raises questions about the extent to which chapter 2's findings can be generalised across different performance domains. For instance, the effects of stereotype threat on motor task performance are driven by different mechanisms to its

effects on cognitively demanding tasks (Schmader et al., 2008). As such, it is unclear whether the current findings can be generalised to other tasks, such as motor tasks.

Conclusion

The findings of chapter 2 suggest that regulatory focus and motivational state moderate effects of stereotype valence on performance: prevention focus and challenge induction enhanced performance relative to promotion focus and threat induction in the context of negative stereotypes, but the opposite was true in the context of positive stereotypes. In addition to their theoretical implications regarding the regulatory focus-motivational state relationship, these results also have potential practical applications. For instance, they suggest that the typical detrimental impact of negative stereotypes on performance in real-world settings could be ameliorated by helping test-takers to experience increased challenge or an enhanced prevention focus. Likewise, the performance of positively stereotyped individuals could be improved by inducing threat or a promotion. The fact that motivational state and regulatory focus can be manipulated through something as simple as a task's point system testifies to the practical feasibility of such an approach.

Chapter Three: Stereotype Threat and beliefs about Anthropogenic Global Warming

Anthropogenic Global Warming

Numerous independent lines of evidence indicate that the Earth is currently warming, primarily as a consequence of anthropogenic increases in carbon dioxide (Karl et al., 2015; Rajaratnam, Romano, Tsiang & Diffenbaugh, 2015; Shakun et al., 2012; Vinnikov & Grody, 2003). There is consequently an overwhelming consensus among climate scientists, and among scientists in general, that anthropogenic global warming (henceforth AGW) is occurring (Anderegg, Prall, Harold & Schneider, 2010; Carlton, Perry-Hill, Huber & Prokopy, 2015; Cook et al., 2013; Cook et al., 2014; Cook et al., 2016; Doran & Zimmerman, 2009). However, in spite of the near total acknowledgement of the reality of AGW within the scientific community, rejection of the reality of AGW is prevalent among the publics of numerous countries around the world (Lorenzoni & Pidgeon, 2006; Smith & Leiserowitz, 2012). Given the importance of public support for policies designed to combat the potentially disastrous effects of AGW (Mann, 2013), there is therefore a clear need to understand the psychological mechanisms that influence beliefs about climate change and the tendency to deny the reality of AGW.

Prior research in this area has identified the mischaracterisation of climate science by the media (Boykoff, 2007; Boykoff & Boykoff, 2004) and the dissemination of climate change misinformation by groups supported by the fossil fuel industry (Brulle, 2014) as key factors responsible for the discrepancy in AGW-related beliefs among the scientific and some lay communities. At the individual level, research has shown that priming of political identities (Unsworth & Fielding, 2014) and the way in which messages about climate change are framed (Nisbet, 2009) can influence beliefs about AGW.

Given that stereotype threat has been shown to affect attitudes towards and beliefs about science among certain stereotyped groups (Cheryan, Meltzoff & Kim, 2011; Cheryan,

Plaut, Davies & Steele, 2009; Rios, Cheng, Totton & Shariff, 2015), and given that attitudes towards scientists have been found to correlate significantly with views on AGW (Hmielowski, Hutchens & Cicchirillo, 2014), there is reason to believe that stereotype threat may indeed have an impact on AGW-related beliefs. This could have important implications in terms of the methods available to influence public beliefs about AGW in a desirable manner.

Stereotype Threat and Belief in AGW

When people are subject to stereotype threat, they employ a number of cognitive and behavioural strategies to eliminate the negative affective state that it activates (Schmader et al., 2008). One such strategy involves denying the validity of the negative stereotype (Von Hippel et al., 2005) – if the stereotype is perceived as inaccurate, then the negative implications that it has for the individual’s valued group identity are diminished. Indeed, the detrimental impact of stereotype threat on performance can be eliminated by exposing stereotype-threatened individuals to counter-stereotypical exemplars, which challenge the veracity of the stereotype (Marx & Roman, 2002; McIntyre et al., 2003).

Similarly, stereotype threatened individuals can themselves challenge the veracity of the negative stereotype by performing well on a stereotype-related task. In doing so, they themselves counterevidence the stereotype, because their strong performance is inconsistent with the supposed low ability of their group (Jamieson & Harkins, 2007). Consequently, stereotype threat induces an increased desire to disconfirm the negative stereotype by displaying high levels of the stereotype-relevant ability (Schmader et al., 2008), as evidenced by increased effort (Forbes et al., 2008), and self-reports of thoughts and feelings experienced under stereotype threat (Beilock, Rydell & McConnell, 2007).

I expected (and confirmed in experiment 5) that most people perceive (non-)belief in AGW to be indicative of scientific (in)competence. In others words, individuals who are described as deniers of AGW are generally perceived as less scientifically competent than

individuals who are described as believing in AGW. As such, people exposed to a negative science-related stereotype about their group might express increased belief in AGW in order to disconfirm the stereotype (Schmader et al., 2008). If most people appreciate that AGW is generally recognised as having scientific legitimacy, then they may consider that expressing increased belief in AGW would help to affirm their own scientific astuteness, thereby countering the negative stereotype about their group's scientific ability. This would mean that enhancing one's belief in AGW would be utilised as a means of resolving stereotype threat-induced discomfort, leading to the hypothesis that high (vs. low) science-related stereotype threat would be associated with increased belief in AGW (hypothesis 3).

Moreover, it is reasonable to expect that this prediction would apply not only to science-related stereotype threat, but also to forms of stereotype threat that relate to some other ability domains that are not specifically scientific in nature. If denial of AGW is considered to be indicative of scientific incompetence, then it would also be indicative of incompetence in ability domains that are perceived to be related – but not equivalent – to scientific competence, such as general cognitive ability (Yager & Penick, 1986). For this reason, hypothesis 3 was predicted to apply to situations involving science-related stereotype threat, but also to situations involving negative stereotypes pertaining to general cognitive ability.

Furthermore, for reasons that will be explained in the following section, I hypothesised that there would also be interactions between stereotype threat and four other variables in determining belief in AGW. These other variables were implicit beliefs about the nature of ability, the perceived effectiveness of a strategy to cope with stereotype threat (manipulated via the content of a persuasive message about AGW), the framing of a persuasive message about AGW, and temperature. In the following sections, I will explore these variables in more detail and outline the justification for their proposed interactions with stereotype threat.

Implicit Beliefs about Scientific Ability

Individuals vary in terms of their beliefs about the extent to which ability is fixed or malleable (Dweck, 1999). At one extreme, entity theorists view ability as a fixed, largely innate trait that is difficult to alter through practice or the application of effort; at the other extreme, increment theorists view ability as a highly malleable construct that changes over time as a consequence of practice and learning experiences (Grant & Dweck, 2003).

Entity theorists tend to be more motivated to demonstrate that they possess high ability compared to increment theorists (Dweck, 1999). For entity theorists, low ability constitutes a permanent handicap that cannot be overcome by increased effort, whereas for an increment theorist low ability is a temporary problem that can be remedied through subsequent learning (Molden & Dweck, 2006). The idea of having low ability is therefore far more aversive for entity theorists than for increment theorists (Dweck & Leggett, 1988), and this greater aversion is evident from their reactions to failure. For instance, the error related negativity (ERN) is an EEG signal that arises from activity in the anterior cingulate cortex around 80ms after the detection of an error (Moser, Moran, Schroder, Donnelan & Yeung, 2014). A large body of evidence indicates that ERN magnitude is associated with the negative affect triggered by error commission, and that it can thus serve as an index of the extent to which an individual wishes to avoid failure and mistakes (Proudfit, Inzlicht & Menin, 2013). Entity theorists have been shown to exhibit higher magnitude ERNs compared to increment theorists when informed of an error that they have committed (Mangels et al., 2006), indicating that entity theorists are more aversive to the low ability implications of failure.

Similarly, entity theorists employ more self-protective strategies following failure compared to increment theorists. For instance, the negative affect that arises when one realises that one may lack a particular ability (e.g. after failing on a maths test) can be diminished by reducing the perceived value of the ability domain (e.g. by adopting the view that 'maths is stupid'; Major, Spencer, Schmader, Wolfe & Crocker, 1998). Evidence

suggests that entity theorists employ this domain devaluation strategy to a greater extent than increment theorists (Aronson et al., 2002), indicating that the former are more averse to the prospect of displaying low ability in a valued domain. For instance, Aronson (1997) found that entity theorists tended to devalue the ability tested by a task when given bogus failure (rather than success) feedback about their performance thereon, whereas this was not the case for increment theorists. Thus, holding an entity (rather than increment) theory leads people to ascribe greater value and importance to personal ability, as evidenced by increased usage of defensive strategies (such as domain devaluation) in response to events that call their ability into question (such as task failure; Molden & Dweck, 2006).

This has implications for the ways in which increment and entity theorists would be likely to respond to stereotype threat-inducing situations. Entity theorists would be more disturbed by the idea that they or their group have low ability, and would therefore be expected to exhibit more intense responses to stereotype threat than increment theorists. Indeed, Aronson et al. (2002) found that an intervention designed to encourage students to adopt an increment theory improved the academic performance of African Americans (who frequently experience stereotype threat; Keller, 2012; Steele, 1997) relative to whites. Similarly, Froehlich et al. (2016) found that individuals who held entity beliefs in relation to a stereotyped ability were more susceptible to the effects of stereotype threat on performance than individuals who held increment beliefs.

If entity theorists find the idea of having low ability more aversive, then they should make more effort to find ways to invalidate negative stereotypes about their group's ability when they are reminded of these stereotypes. Conversely, increment theorists would be relatively unconcerned by the idea that they or their group lacks ability, meaning that they would be less likely to attempt to disconfirm any negative stereotypes about their group (Molden & Dweck, 2006). If expressing belief in AGW is viewed as an effective means of challenging a negative science-related stereotype about one's group (as proposed above), then it follows that only entity theorists, but not increment theorists, would increase their

belief in AGW when subject to stereotype threat. Thus, it was hypothesised that high vs. low stereotype threat would be associated with increased belief in AGW among entity theorists, but not among increment theorists (hypothesis 4). Experiments 6 and 7 tested this hypothesis.

Perceived effectiveness of a strategy to cope with Stereotype threat

It was also hypothesised that the effects of science-related stereotype threat on beliefs about AGW would be modulated by the extent to which altering such beliefs would be perceived as an effective strategy for coping with stereotype threat (manipulated via the content of a persuasive message about climate change).

This prediction was based on evidence showing that when people experience cognitive dissonance, a range of different strategies can be used to facilitate the resolution thereof (Festinger, 1956; Stone et al., 1994; Steele, 1988). For instance, the conflict between the cognitions “I smoke” and “smoking is unhealthy” can be reduced by denying the unhealthy properties of cigarettes, invoking the stress-relieving benefits of smoking, devaluing the importance of a healthy lifestyle, or committing to not smoking in future (McMaster & Lee, 1991). Festinger (1956) proposed that people’s dissonance-reduction strategy selection would favour the option that required the least amount of cognitive effort and reality distortion and that minimised the individual’s acceptance of aversive conclusions.

Indeed, evidence indicates that the strategies people use to resolve cognitive dissonance vary depending on the relative ease of each strategy. For example, when people observe another innocent person’s suffering, they experience cognitive dissonance because their observation contradicts the widely-held belief that bad things tend not to happen to good people (Jost, Glaser, Kruglanski & Sulloway, 2003; Lerner, 1997). When people are able to prevent the observed suffering through their own non-costly actions, they almost always take these actions in order to resolve the cognitive dissonance (Lerner & Miller,

1978). However, when no non-costly courses of action are available to prevent the observed suffering, people are forced to utilise alternative strategies to eliminate the cognitive dissonance. For instance, people typically make unfavourable evaluations of the victims of misfortune so that their suffering is not perceived to contradict the belief that bad things do not happen to good people (Lerner & Miller, 1978).

Likewise, people tend to select the dissonance-reduction strategy that seems most realistic and that therefore requires minimal reality distortion (Festinger, 1956). For instance, Zagefka, Noor, Brown, de Moura and Hopthrow (2011) found that people are more likely to ascribe blame to victims of human-caused, rather than natural, disasters - thereby reducing the cognitive dissonance aroused by the knowledge that blameless people are suffering – because it seems more reasonable (and thus requires less reality distortion) to blame someone for a man-made disaster (which could be evoked by inciting conflict or electing an incompetent government) rather than a natural disaster (which people cannot be reasonably claimed to control). Thus, dissonance resolution typically follows the ‘path of least resistance’, i.e. the alternative that minimises the reality distortion and cognitive effort involved in eliminating the perceived inconsistency (Festinger, 1956).

Moreover, certain dissonance-reduction strategies may be viewed as providing a more satisfying resolution to the cognitive dissonance than others, and they may therefore be more likely to be selected. For example, stereotype threat-induced cognitive dissonance triggers an increased desire to perform well on stereotype-related tasks in order to resolve the cognitive dissonance by invalidating the negative stereotype (Forbes et al., 2008; Jamieson & Harkins, 2007). Alternative means of resolving the cognitive dissonance, such as devaluing the perceived importance of the stereotyped domain (Woodcock, Hernandez, Estrada & Schultz, 2012), are less appealing and are therefore only likely to be used if the individual believes that they lack the capacity to perform well (Hoyt & Blascovich, 2010). Whilst strong performance would provide decisive evidence of the inapplicability of the stereotype to the individual, domain devaluation may involve some degree of self-deception

and could therefore be perceived as a less convincing resolution to stereotype threat-induced cognitive dissonance. Thus, certain methods of resolving cognitive dissonance (e.g. exhibiting strong performance in the context of a negative stereotype) may be perceived as providing a more convincing resolution than others, and may consequently be more likely to be selected when available.

It follows that altering the extent to which a particular science-related dissonance-reduction strategy is perceived as effective will influence its likelihood of being used. For instance, if people are led to perceive expressing belief in AGW as a highly effective way of resolving stereotype threat-induced cognitive dissonance, then their belief in AGW should increase when they are subject to science-related stereotype threat. It was therefore predicted that altering the extent to which expressing belief in AGW was seen as an effective strategy to address stereotype threat (operationalised through the provision of different messages about AGW) would influence whether or not this strategy would be used in the face of stereotype threat (hypothesis 5). After all, it would not be sensible to expect people to employ strategies which they would perceive as ineffective. Experiment 8 investigated this possibility. Following a stereotype threat manipulation relating to their religious identity, Christian participants read one of three messages about global warming. These messages described how Church leaders (message 1), Scientists (message 2), or both Church leaders and scientists (message 3) from across the world had come together in urging governments to take action to combat AGW.

Participants who were reminded of the widespread scientific consensus on AGW (as in messages 2 and 3) would be more likely to view belief in AGW as an indication of scientific competence, which would enhance the extent to which the endorsement thereof would be perceived as an effective way of counter-evidencing the “Christians lack scientific ability” stereotype⁷. Informing participants of the widespread belief in AGW within the

⁷ Although, as noted above, a large majority of people would already be aware of the scientific consensus on AGW, it is likely that explicitly mentioning this consensus would further increase people’s tendency to view AGW as a scientifically valid position (van der Linden, Leiserowitz,

Church (as in messages 1 and 3) would also enhance the extent to which endorsement of AGW would be perceived as an effective way of countering the negative stereotype, because such endorsement would not only serve to display personal scientific ability, but it would also imply the perceived scientific astuteness of the wider Church through its association with a valid scientific position. In contrast, denying the veracity of AGW following exposure to message 1 or 3 would imply a lack of scientific competence within the Church, which would be detrimental to participants' attempts to reduce stereotype threat-induced cognitive dissonance. Thus, the mention of widespread belief in AGW among scientists (in messages 2 and 3) and within the Church (in messages 1 and 3) would enhance the tendency to express belief in AGW among Christians exposed to the "Christians lack scientific ability" stereotype. For participants exposed to message 3, there would therefore be two factors within the message serving to enhance the extent to which expressing belief in AGW would be perceived as an effective way of reducing stereotype threat-induced cognitive dissonance. For participants exposed to messages 1 and 2, there would only be one factor within each message serving to enhance the extent to which expressing belief in AGW would be perceived as an effective way of reducing stereotype threat-induced cognitive dissonance.

On this basis, hypothesis 5 led to the prediction that the stereotype threat manipulation would interact with the message manipulation in determining belief in AGW. Specifically, I predicted that high (vs. low) stereotype threat would be associated with increased belief in AGW in all three message conditions, but that the effect of the stereotype threat manipulation would be greater for participants exposed to message 3 relative to those exposed to messages 2 and 1.

In addition to investigating the impact of the aforementioned independent variables on belief in AGW, experiment 8 also sought to investigate whether their effects would

Feinberg, & Maibach, 2015). Analogously, even though the vast majority of people are aware of the negative health effects of smoking, explicit reminders of these negative effects can reduce the appeal of cigarettes (Wong, Nisbett & Harvell, 2017). Thus, although most participants would initially view endorsement of AGW as a scientifically valid position, an explicit reminder of the related scientific consensus would be expected to reinforce and enhance this pre-existing belief.

extend to a behavioural measure related to AGW. Specifically, participants were given the opportunity, at no personal cost, to direct a small amount of the experimenter's money to an organisation involved in disseminating accurate information about AGW. Based on previous research showing that acknowledgement of the reality and danger of AGW is associated with behaviours that facilitate the prevention thereof (Ferguson & Branscombe, 2010; Gifford, 2011; Jang, 2013), it was predicted that greater belief in AGW would cause an increased tendency to donate money. This led to the hypothesis that high (vs. low) stereotype threat would be associated with higher monetary donations; this effect was predicted to be mediated by the effect of stereotype threat on belief in AGW (hypothesis 6). Furthermore, it was hypothesised that the effect of stereotype threat on donation behaviour would be greater for participants exposed to message 3 as opposed to message 1 or 2; again, this interaction was predicted to be mediated by the interactive effects of stereotype threat and message content on belief in AGW (moderated mediation; hypothesis 7). In other words, hypothesis 7 proposed that the cross-condition variation in belief in AGW predicted by hypothesis 5 would lead to a corresponding pattern of cross-condition differences in donation behaviour as a result of the direct effect of belief in AGW on donation behaviour.

Message Framing

I also investigated the way in which differences in message framing could alter the impact of stereotype threat. Specifically, I examined whether the effects of climate change messages that were framed positively (e.g. "successful mitigation of climate change will help the environment") rather than negatively (e.g. "failure to mitigate climate change will harm the environment") would vary as a function of stereotype threat.

This possibility was tested in experiment 9, which used a variation of the stereotype threat manipulation employed in experiments 6, 7 and 8. American participants were either told (high stereotype threat) or not told (low stereotype threat) that Americans tended to perform poorly on an ostensibly forthcoming test of cognitive ability. I expected this stereotype threat manipulation to have the same effect as the corresponding manipulations in

experiments 6, 7 and 8, such that high stereotype threat would be associated with increased belief in AGW (hypothesis 3).

It was also predicted that positively framed messages would be associated with greater belief in AGW compared to negatively framed messages (hypothesis 8), and that this effect would be particularly pronounced for participants who were subject to high (vs. low) stereotype threat (hypothesis 9). This hypothesis was based on the proposal (Proulx, Inzlicht & Harmon-Jones, 2012) that the inconsistency resolution mechanisms activated by dissonance in one area of cognition can spill over to other areas of cognition. In other words, exposure to a single cognitive dissonance-inducing discrepancy can create a general desire to achieve consistency in areas that are both related and unrelated to the original discrepancy. For example, experimental manipulations that emphasise a discrepancy between the desire for personal control and awareness of its absence have been found to increase the tendency to perceive consistent relationships between unrelated events (Whitson & Galinsky, 2008). When people are non-consciously exposed to a perceptual phenomenon that is inconsistent with their beliefs about the world, they behave more consistently with their personal values by endorsing harsher punishments for people whose behaviour violates those values (Proulx & Heine, 2008). The same effect is observed when people are presented with absurd jokes (Proulx, Heine & Vohs, 2010) or nonsense word pairs (Randles, Proulx & Heine, 2011). Moreover, when people are instructed to argue against their own self-unity (which is inconsistent with the desire to function in accordance with a coherent identity), they display an enhanced capacity to detect statistical regularities in sequences of letter strings (Proulx & Heine, 2009). The same effect occurs when people are presented with nonsense word pairs (Randles et al., 2011). Thus, a large body of evidence indicates that exposure to an inconsistency in one domain (e.g. a lack of personal control; violation of perceptual or linguistic expectancies) leads to an increased desire to detect or perceive consistency in domains that are unrelated to the initial inconsistency (e.g., behaviour that is consistent with personal values; detecting statistical regularities in sequences of letter strings). This supports

the view (Proulx et al., 2012) that the inconsistency resolution mechanisms activated in response to the perception of a specific discrepancy can “spill over” into areas of cognition that are unrelated to the initial discrepancy.

It follows that stereotype threat-induced cognitive dissonance should trigger an increased motivation to perceive and detect consistency, even in relation to information that is irrelevant to the negative stereotype. For instance, messages that highlight the ongoing and future negative consequences of AGW (rather than the positive consequences of successful prevention thereof) may evoke cognitive dissonance because the idea that the world is becoming more dangerous may conflict with the desire to live in a safe world (McCright & Dunlap, 2011a; Scruggs & Benegal, 2012). Denying the reality of AGW can serve as a means of avoiding the cognitive dissonance associated with this particular belief-desire discrepancy (Scruggs & Benegal, 2012). As such, negatively framed (vs. positively framed) messages should evoke reduced belief in AGW, because denying AGW would help to resolve the cognitive dissonance evoked by a negatively framed message. Thus, one would expect a main effect of message framing on AGW-belief-endorsement, so that belief in AGW would be higher for positively framed messages (hypothesis 8).

Moreover, if stereotype threat creates a general desire for consistency, and if denying AGW can help to achieve a sense of consistency following exposure to messages describing its negative consequences, then it follows that the effect of negatively framed (vs. positively framed) messages in reducing belief in AGW should be greater for participants exposed to high stereotype threat as opposed to low stereotype threat. Note that, since all forms of stereotype threat induce cognitive dissonance regardless of the content of the stereotype (Schmader et al., 2008), this proposed interaction should not be dependent on the content of the stereotype used to induce stereotype threat (e.g. it should be observed regardless of whether the stereotype threat involved is related to scientific ability).

It was therefore hypothesised that stereotype threat (high vs. low) would interact with the content of a persuasive message about climate change (stressing positive

implications of successfully preventing AGW vs. stressing potential negative implications of failure to prevent AGW) in predicting beliefs about AGW. I predicted that belief in AGW would be increased for participants exposed to positively framed (vs. negatively framed) messages, and that this effect would be particularly pronounced for participants exposed to high (rather than low) stereotype threat (hypothesis 9). Note that in this instance, stereotype threat was proposed to be a moderator of the effects of message framing, and not the other way around.

Temperature

Research indicates that people's belief in AGW increases following recent experiences of warm weather or high temperatures in a laboratory setting (Hamilton & Stampone, 2013; Li, Johnson & Zaval, 2011; Zaval, Keenan, Johnson & Weber, 2014). This results from a cognitive process known as attribute substitution, where a complex judgement (e.g. assessing the existence or extent of AGW) is replaced with a simple judgement (e.g. evaluating recent temperature trends; Kahneman, 2003). Attribute substitution reduces the amount of cognitive effort required to make a judgement, and it is therefore typically observed when individuals are unmotivated to expend cognitive resources (Fazio, 2001). However, evidence indicates that cognitive dissonance increases people's motivation to expend cognitive resources in the judgements that they make – including judgements that are not related to the source of the cognitive dissonance (Inzlicht, Bartholow & Hirsch, 2015).

For instance, in the classic Stroop (1935) task, participants are asked to classify the font colour of words in which the font and spelling are either congruent (e.g. the word “red” written in red font) or incongruent (e.g. the word “red” written in green font). Incongruent trials produce cognitive dissonance because the font and spelling activate conflicting responses (Harmon-Jones et al., 2009). Brain imaging studies reveal that these incongruent trials trigger a cascade of neural responses designed to motivate the increased cognitive effort that is necessary to inhibit the inappropriate response activated by the word's spelling (Kerns, Cohen, MacDonald, Cho, Stenger & Carter, 2004). Indeed, incongruent Stroop trials

have been found to evoke a range of physiological and affective responses that typically occur in the context of increased cognitive effort (Dreisbach & Fischer, 2012). Likewise, other instances of cognitive dissonance, such as the conflict between the desire to avoid errors and the realisation of a recent personal error, also induce increases in cognitive effort (Iannaccone, Hauser, Staempfli Walitza, Brandeis & Brem, 2015). Indeed, stereotype threat, which is a form of cognitive dissonance, has been found to trigger increased cognitive effort during task performance (Forbes et al., 2008; Jamieson & Harkins, 2007). More generally, stereotype threat has been found to induce threat (see chapter 2; Vick et al., 2008), and people tend to exert more effort in judgement formation when experiencing threat, even for judgements that are unrelated to the task that the individual finds threatening (Fonseca, Blascovich & Garcia-Marques, 2014).

Since the use of temperature cues to judge the veracity and extent of AGW is only observed in individuals who lack the motivation to exert cognitive effort (Zaval et al., 2014), it follows that high (vs. low) stereotype threat would reduce the impact of temperature on belief in AGW. On this basis, it was hypothesised that exposure to high (vs. low) temperatures would be associated with increased belief in AGW for participants exposed to low stereotype threat, but that there would be no effect of temperature on belief in AGW for participants exposed to high stereotype threat (hypothesis 10).

These predictions were tested in experiment 10, in which a sample comprised entirely of American participants was used. Participants were either told (high stereotype threat condition) or not told (low stereotype threat condition) that Europeans tended to outperform Americans on the ostensibly forthcoming science test. Experiment 10 also tested the hypothesised stereotype threat*temperature interaction using a measure (rather than a manipulation) of perceived temperature – the prediction here was that perceived temperature would be correlated with belief in AGW under low, but not high, stereotype threat.

Experiment 8 also employed a measure of perceived temperature in addition to a manipulation thereof in order to test this same prediction. Because the temperature measure

was placed after all the other measures in experiment 8, its presence did not affect the validity of the rest of the experimental design in any way. Thus, although experiment 10 undertook the main investigation of hypothesis 10, this hypothesis was also examined in experiment 8.

Summary of Hypotheses of Chapter 3

In summary, a number of hypotheses were formulated on the basis of Schmader et al.'s (2008) view that stereotype threat involves cognitive dissonance.

Prior to testing these hypotheses, it was first necessary to establish that people generally perceive (non-)belief in AGW as indicative of scientific (in)competence, because this was a central premise underlying much of the reasoning presented above. Experiment 5 therefore tested the prediction that an individual described as believing in AGW would be perceived as more scientifically competent than an individual described as not believing in AGW.

Experiments 6 and 7 tested the prediction that high (vs. low) stereotype threat would be associated with increased belief in AGW overall (hypothesis 3), but only for participants induced to adopt an entity (rather than increment) theory of ability (hypothesis 4).

Experiment 8 tested the hypothesis that high (vs. low) stereotype threat would be associated with increased belief in AGW, and that this effect would be greater for participants exposed to message 3 relative to those exposed to messages 1 or 2 (hypothesis 5). Experiment 8 also tested the hypothesis that donations to an organisation promoting belief in AGW would be increased for participants exposed to high (vs. low) stereotype threat, and that this effect would be mediated by increased belief in AGW under high stereotype threat (hypothesis 6). Furthermore, experiment 8 tested the hypothesis that the enhancing effect of high (vs. low) stereotype threat on amount donated would depend on the perceived effectiveness of expressing belief in AGW as a strategy for reducing stereotype threat-induced cognitive dissonance (manipulated via exposure to different messages), and

that this effect would be mediated by the interaction between stereotype threat and message content in determining belief in AGW (hypothesis 7).

Experiment 9 tested the hypothesis that a negatively framed message about climate change would evoke less belief in AGW than a positively framed message (hypothesis 8), and that this effect would be greater for participants exposed to high (rather than low) stereotype threat (hypothesis 9).

Experiment 10 tested the hypothesis that exposure to high (vs. low) temperature would be associated with increased belief in AGW, but that this would only be true for participants exposed to low (vs. high) stereotype threat (hypothesis 10; experiment 8 also tested this hypothesis).

Across all experiments, it was hypothesised that high (vs. low) stereotype threat would be associated, via a main effect, with increased belief in AGW (hypothesis 3).

Experiment 5

Experiment 5 tested the assumption that people who express belief in AGW are generally perceived as more scientifically competent than people who deny AGW. It was predicted that a target would be perceived as more scientifically competent when described as believing (vs. not believing) in AGW.

Method

Participants and Design

128 non-American participants (31 females) were recruited via CrowdFlower. A between-subjects design was employed, wherein a described individual's belief in AGW (belief vs. non-belief) served as the independent variable, with the perceived scientific competence of this target individual being the dependent variable.

Procedure

Participants were told that they would complete a task in which they would attempt to make judgements about others based on limited information. They were then presented with a description of a target individual (John). This description listed several of John's characteristics (e.g. "John has black hair"; "John is married"). In the belief condition, the final statement about John in this description said "John believes in man-made global warming". In the non-belief condition, the final statement said "John does not believe in man-made global warming". All other statements about John were exactly the same. After reading this description, participants were asked: "On a scale of 1 to 7, how good do you think John is at thinking scientifically? (1 is "not at all good at thinking scientifically" to 7 = "extremely good at thinking scientifically"). Responses to this outcome variable were recorded to index perceptions of John's scientific competence.

Subsequent to the questions about John, another target (Chloe) was described. No aspects of Chloe's description were manipulated across participants, and no mention of global warming was made therein. Participants were then asked to estimate Chloe's ability to think scientifically. The purpose of this addition was to ensure that any effects of the experimental manipulation were specific to John. For instance, one might argue that mentioning belief vs. non-belief in AGW could differentially activate liberal or conservative political identity in the participants (McCright & Dunlap, 2011b), and that this could then have general effects on the way all targets are evaluated. This possibility would be ruled out by demonstrating that the effect of the experimental manipulation was specific to evaluations of John and did not impact evaluations of Chloe.

Following their evaluations of John and Chloe, participants answered the following question on a scale ranging from "strongly agree" to "strongly disagree": "People who do not believe in man-made global warming are worse at thinking scientifically relative to people who do believe in man-made global warming. Do you agree?". The purpose of this was to devise a second, additional test of participants' general agreement with the position that (non-)belief in AGW is associated with scientific (in)competence. It was predicted that

mean responses to this measure would lie significantly above the mid-point (indicating high agreement).

The materials used in experiment 5 are presented in Appendix C.

Results and Discussion

A between-subjects one-way ANOVA was conducted, using belief vs. non-belief as an independent variable, with participants' ratings of John's scientific competence as the dependent variable. Consistent with predictions, John was rated as significantly more scientifically competent when he was described as believing in AGW ($M=4.91$; $SD=1.33$) compared to when he was described as rejecting AGW ($M=3.32$; $SD=1.52$): $F(1,126)=37.43$; $p<.001$; $\eta_p^2=.23$. As expected, no significant effects of the experimental manipulation were found for ratings of Chloe's scientific competence ($F<1$)

A one sample t-test was conducted to assess the deviation from the scale midpoint of responses to the question addressing the link between belief in AGW and scientific ability. As expected, the mean response to the question pertaining to scientific ability was 4.91 ($SD=1.43$), which was significantly higher than the scale midpoint of 4.00: $t(127)=7.18$; $p<.001$.

Taken together, these results strongly support the key premise of the reasoning outlined above, namely that (non-)belief in AGW is generally perceived as indicative of scientific (in)competence.

Experiment 6

Experiment 6 tested the hypothesis that high (vs. low) stereotype threat would be associated with increased belief in AGW, but only for participants induced to adopt an entity (rather than increment) theory of ability (hypothesis 4). Participants were subject to manipulations of stereotype threat (high vs. low) and implicit theories (increment vs. entity). In line with the reasoning presented above, I predicted that when an entity theory was induced, participants who were subject to high stereotype threat would display increased

endorsement of AGW relative to participants who were not exposed to stereotype threat. However, it was predicted that this would not be true of participants who were induced to adopt an increment theory of scientific ability. Thus, a 2x2 interaction was hypothesised between stereotype threat (high vs. low) and implicit theory (entity vs. increment) in determining beliefs about AGW.

Method

Participants and Design

197 non-American participants (77 females) were recruited via CrowdFlower, of whom 3 were excluded for dual participation (leaving 194 participants, including 76 females). A filter was applied at the participant recruitment phase, such that only people with IP addresses located outside the USA were able to participate. Nevertheless, 11 individuals (not included in the figure of 197 above) answered “yes” to the pre-experiment question: “Are you an American?” – these individuals were presumably Americans living outside of the USA. None of these 11 people were included in any of the analyses.

Participants (including those who were excluded from the analyses) were paid \$0.05 for their participation.

A 2x2 between-subjects design was used, in which stereotype threat (high vs. low) and implicit theory of scientific ability (entity vs. increment) functioned as independent variables and Belief in AGW functioned as the dependent variable.

Measures

Belief in AGW. Following previous studies of beliefs about AGW on expert (Carlton et al., 2015) and lay (Hmielowski et al., 2014) samples, the AGW-related beliefs measure contained four items that assessed whether or not participants believed that the Earth’s average temperature has been increasing in recent history, and four items assessing whether

or not participants believed that this temperature increase can be attributed to human actions. The four items assessing beliefs about global temperature increases were: “How likely do you think it is that global warming is occurring now?”, “Global temperatures have been rising significantly over the past decades. Do you agree with this statement?”, “Climate change is definitely NOT occurring. Do you agree with this statement?” (reverse coded), and “The Earth’s oceans have NOT been increasing in temperature in recent decades. Do you agree with this statement?” (reverse coded). The items related specifically to the human role in global temperatures were: “Human activities such as burning fossil fuels can significantly raise the planet’s temperature. Do you agree with this statement?”, “Human actions have NOT resulted in an increase in global temperatures. Do you agree with this statement?” (reverse coded), “Global warming CANNOT be reduced by regulating fossil fuel use. Do you agree with this statement?” (reverse coded) and “Climate change is real and man-made. Do you agree with this statement?”. All items were combined to form a scale of AGW endorsement ranging from 1 (lowest possible endorsement) to 5 (highest possible endorsement; $\alpha = .828$).

Procedure

Experiment 6 employed a 2x2 between-subjects design, in which stereotype threat (high vs. low) and implicit theory of scientific ability (entity vs. increment) were manipulated. Subsequent to the manipulations, participants completed the Belief in AGW scale.

Stereotype Threat Manipulation. All participants were told that they were about to complete a test of scientific ability (in reality there was no test). Half of the participants were told that previous studies had found that test performance was unrelated to the nationality of the test taker (low stereotype threat condition). The other participants were told that non-American participants tended to underperform relative to Americans (high stereotype threat condition).

Implicit Theory Manipulation. In the entity condition, participants were told that some people are naturally gifted when it came to scientific ability whilst others are not. These participants were told that performance on the forthcoming test would be determined primarily by natural ability, rather than effort or prior learning experiences. In the increment condition, participants were informed that according to prior research, their performance on the forthcoming test would be determined primarily by practice and prior learning experiences, rather than natural ability (see Dinger & Dickhäuser, 2013, for a similar manipulation).

The materials used in experiment 6 are presented in Appendix E.

Results

A 2x2 ANOVA using stereotype threat (high vs. low) and implicit theory (entity vs. increment) as independent variables was conducted, with belief in AGW as the dependent variable. Entity theorists expressed marginally greater belief in AGW relative to increment theorists: $F(1,190)=3.66$; $p=.06$; $\eta_p^2=.02$. Moreover, in line with hypothesis 3, high (vs. low) stereotype threat was associated with significantly greater belief in AGW: $F(1, 190)=4.06$; $p=.05$; $\eta_p^2=.02$. However, as hypothesised, this main effect was qualified by a marginally significant interaction: $F(1,190)=2.87$; $p=.09$; $\eta_p^2=.02$ (see Table 5). Although the interaction was only marginally significant, the pattern of results for the simple effects were entirely in line with the predictions of hypothesis 4. Simple effects revealed that high (vs. low) stereotype threat was associated with increased belief in AGW in the entity conditions ($F(1,190)=6.73$; $p=.01$; $\eta_p^2=.03$), but not in the increment conditions ($F(1,190)=.05$; $p=.82$; $\eta_p^2=.00$).

Table 5

Belief in AGW as a Function of Stereotype Threat and Implicit Theory in experiment 6

Stereotype Threat

		High	Low
Implicit	Entity	4.29 (.59) a	3.95 (.60) b
Theory	Increment	3.96 (.71) a	3.93 (.57) a

Note. Standard deviations in parentheses. Postscripts denote significant differences (row-wise).

Discussion

As hypothesised, the results of experiment 6 indicated that participants who were induced to adopt an entity theory of scientific ability expressed greater belief in AGW when subject to high (vs. low) stereotype threat, whereas this was not the case for participants induced to hold an increment theory of scientific ability (hypothesis 4). This suggests that stereotype threat induced a desire to disconfirm the negative stereotype by demonstrating ability in the stereotyped domain (Forbes et al., 2008; Schmader et al., 2008; Jamieson & Harkins, 2007, 2010), leading participants to enhance their endorsement of the scientific consensus on AGW in order to demonstrate their own scientific understanding. However, since increment theorists tend to be relatively less concerned about whether or not they possess high ability, these individuals would be relatively indifferent to the negative ability implications of stereotype threat and would have therefore felt no desire to invalidate the negative stereotype by affirming their own scientific abilities. This explains why increment theorists did not enhance their reported endorsement of AGW under high (vs. low) stereotype threat.

Following from these results, experiment 7 sought to replicate the results of experiment 6 using a different sample and stereotype. Specifically, experiment 7 took advantage of the stereotype that Christians lack scientific ability (Rios et al., 2015).

Experiment 7

Experiment 7 sought to replicate the findings of experiment 6, utilising a different science related stereotype, namely the stereotype that Christians lack scientific ability (Rios

et al., 2015). Christian participants were recruited and subject to manipulations of stereotype threat (high vs. low) and implicit theories (increment vs. entity). In line with the reasoning presented above, I predicted that when an entity theory was induced, Christians who were subject to high stereotype threat would display increased endorsement of AGW relative to Christians who were not exposed to stereotype threat. However, I predicted that this would not be true of Christians who were induced to adopt an increment theory of scientific ability. Thus, a 2x2 interaction was hypothesised between stereotype threat (high vs. low) and implicit theory (entity vs. increment) in determining beliefs about AGW.

Method

Participants and Design

In order to be included in the study, a given participant had to respond affirmatively to the question “Are you a Christian?”, and score above the mid-point on a 5-point scale of religiosity. These criteria were used because evidence suggests that only Christians who are high in religiosity experience stereotype threat when reminded of the stereotype that ‘Christians lack scientific ability’ (Rios et al., 2015). Indeed, people in general tend not to be susceptible to stereotype threat if they do not identify with the stereotyped group (Schmader, 2002). Using these criteria, 173 Non-American participants (53 females) qualified to participate in the study. The decision to focus solely on Christians (as defined herein) was made prior to the collection of the data.

Participants (including those who were excluded from the analyses) were paid \$0.05 for their participation.

A 2x2 between-subjects design was used, in which stereotype threat (high vs. low) and implicit theory of scientific ability (entity vs. increment) functioned as independent variables and Belief in AGW functioned as the dependent variable.

Measures

Religiosity. The religiosity measure contained four items based on Wilkes, Burnett and Howell (1986). Two of these items asked participants to rate, on a scale of 1 to 5, the extent to which the following statements were true of them: “I attend religious services regularly” and “Spiritual values are more important than material things”. They were also asked “What is the general importance of God in your life?” (responses were “not at all important”; “unimportant”; “somewhat important”; “important” and “very important”) and “How would you characterise yourself in terms of religiosity?” (responses were “anti-religious”; “not at all religious”; “slightly religious”; “moderately religious” and “very religious”; $\alpha = .522$).

Belief in AGW. The same measure of belief in AGW as used in experiment 6 was employed ($\alpha = .865$).⁸

Procedure

Experiment 7 employed a 2x2 between-subjects design. Participants first stated whether or not they were a Christian and completed the religiosity measure. They were then told that they were about to complete a test of science ability (in reality they never took this test).

Stereotype Threat Manipulation. Half of the participants were told that previous studies had found that test performance was unrelated to the religion of the test-taker (low stereotype threat condition). For the other participants, no such information was mentioned (high stereotype threat condition). Previous studies have found this to be an effective manipulation of stereotype threat among members of groups that are aware of negative domain-relevant ingroup stereotypes (Keller & Bless, 2008; Smith & White, 2002). Simply mentioning that a test is diagnostic of a stereotyped ability is sufficient to activate stereotype threat among these group members, whereas explicitly invalidating the stereotype eliminates

⁸ Some other measures were administered after the Belief in AGW measure. Since these were purely exploratory, the relevant data are not included in the analyses reported herein.

the stereotype threat (Keller & Bless, 2008; Smith & White, 2002). Indeed, Rios et al. (2015) demonstrated that Christians tend to be aware of the fact that they are perceived as lacking scientific ability, meaning that the mention of a forthcoming science test would be sufficient to induce them to experience stereotype threat (Steele, 1997).

Implicit Theory Manipulation. The same implicit theory manipulation as in experiment 6 was employed.

The materials used in experiment 7 – other than those taken from the preceding experiments – are presented in Appendix F.

Results

A 2x2 between subjects ANOVA was conducted using implicit theory (increment vs. entity) and stereotype threat (high vs. low) as independent variables, with AGW beliefs as the dependent variable. Contrary to the predictions of hypothesis 3, the main effect of stereotype threat was not significant: $F(1,169)=1.55$; $p=.22$; $\eta_p^2=.01$. Likewise, the main effect of implicit theory was not significant: $F(1,169)=.037$; $p=.85$; $\eta_p^2=.04=.00$. However, consistent with hypothesis 4, the interaction was significant: $F(1,169)=6.52$; $p=.012$; $\eta_p^2=.04$ (see Table 6). Simple effects analyses showed that in the entity theory conditions, endorsement of AGW was greater for participants who were subject to high stereotype threat compared to those subject to low stereotype threat: $F(1,169)=3.89$; $p=.050$; $\eta_p^2=.02$. For the increment theory cells, AGW beliefs in the high stereotype threat condition did not differ significantly from the low stereotype threat condition: $F(1,169)=1.84$; $p=.18$; $\eta_p^2=.02$. These results are consistent with hypothesis 4.

Table 6

Belief in AGW as a Function of Stereotype Threat and Implicit Theory in experiment 7

		Stereotype Threat	
		High	Low
Implicit	Entity	4.05 (.75) a	3.74 (.69) b
Theory	Increment	3.90 (.71) a	4.16 (.76) a

Note. Standard deviations in parentheses. Postscripts denote significant differences (row-wise).

Discussion

Consistent with hypothesis 4, the results of experiment 7 replicated those of experiment 6, indicating that when an entity theory was induced, participants who experienced high stereotype threat expressed greater belief in AGW compared to participants who were not subject to stereotype threat. However, this was not true for participants who were induced to adopt an increment theory with respect to scientific ability. The main effects of stereotype threat and implicit theory of ability were not significant.

Experiment 8

Experiment 8 sought to extend the findings of experiments 6 and 7 by investigating the impact of stereotype threat on people's responses in the context of different messages about AGW, which implied that endorsing an AGW belief would be a differentially effective means of combatting ST. Participants were subject to the stereotype threat manipulation used in experiments 6 and 7. Participants then read one of three messages about global warming. These messages described how Church leaders (message 1), Scientists (message 2), or both Church leaders and scientists (message 3) from across the world had come together in urging governments to take action to combat AGW. It was predicted that high (vs. low) stereotype threat would be associated with increased belief in AGW as a main effect (hypothesis 3). It was further predicted that this effect of stereotype threat would be evident among participants in all three message conditions, but that it would be significantly greater for participants exposed to message 3 (hypothesis 5).

Experiment 8 also tested whether these effects would extend to a behavioural measure related to AGW, namely donating (at no personal cost) to an organisation devoted to spreading accurate information about AGW. It was hypothesised that high (vs. low) stereotype threat would be associated with increased donations, and that this effect would be mediated by increased belief in AGW among participants in the high stereotype threat conditions (hypothesis 6). It was further hypothesised that the effect of stereotype threat on donation behaviour would be increased for participants exposed to message 3 relative to those exposed to message 1 or 2. This interaction was predicted to be mediated by the interactive effects of stereotype threat and message content on belief in AGW.

Method

Participants and Design

The same criteria employed in experiment 7 to select religious Christian participants was employed in experiment 8. 219 non-American participants (70 females) who satisfied these criteria were recruited via CrowdFlower.

Participants (including those who were excluded from the analyses) were paid \$0.05 for their participation.

A 2x3 between-subjects experiment design was used, with stereotype threat (high vs. low) and message content (Church leaders endorse action against AGW vs. Scientist endorse action against AGW vs. Church leaders and Scientists endorse action against AGW) as independent variables. Dependent variables of interest were belief in AGW and donations to an AGW activism organisation. The former dependent variables was also examined as a mediator of the potential interactive effects of the independent variables on the latter.

Measures

Religiosity and Belief in AGW. The religiosity measure ($\alpha = .496$) and the AGW belief measure ($\alpha = .837$) were the same as those used in experiment 7.

Donations. Participants were given the opportunity to donate to an organisation devoted to informing people about the reality of AGW. Specifically, participants were told that they had the opportunity to donate up to \$.05 of the experimenter's money to the Skeptical Science organisation, which produces blog posts, apps and scientific publications debunking common myths propagated by prominent AGW-denying individuals and organisations (Cook et al., 2014). Participants were told (truthfully) that the amount that they chose to donate would have no effect on the amount that they were paid for the experiment – whatever they chose not to donate to Skeptical Science would be taken back by the experimenter.

Temperature Perceptions. As indicated above, although not the primary focus of this study, a temperature measure was also included (c.f. experiment 10, hypothesis 10). Participants were asked to rate how hot they currently felt (on a scale from 1 to 10) and how hot the temperature today had been in their local area compared to temperatures over the past month (on a scale of 1 to 10; inter-item $r(217) = .48$; $p < .001$). Responses to these two items were averaged to form a single measure of current temperature perceptions (henceforth perceived temperature).

Procedure

A 2x3 between subjects design was employed wherein stereotype threat and message content were manipulated. The procedure for experiment 8 followed that of experiment 7, except that this time message content rather than implicit theory was manipulated. Before AGW beliefs were measured, participants were subject to the message manipulation. Participants were randomly assigned to read one of three messages about climate change. The first, second and third messages described how Church leaders, scientists or Church leaders and scientists, respectively, had come together to urge governments to take action against climate change. After belief in AGW was measured, the donation and temperature perception measures were administered.

Although temperature perceptions were intended to serve as an independent variable (with belief in AGW as a dependent variable), they were nevertheless measured after the belief in AGW measure was administered. This is because the impact of subtle situational cues such as temperature can sometimes be eliminated when participants are explicitly directed to focus on these cues (Schwarz et al., 1998). For instance, Schwarz and Clore (1991) found that hot weather led participants to report greater subjective wellbeing, but only when they were asked to report their perception of the weather after, rather than before, reporting their subjective wellbeing. Likewise, focusing on the local temperature before being asked about AGW might eliminate the impact of temperature on belief in AGW. For this reason, temperature perceptions were assessed *after* belief in AGW.

The materials used in experiment 8 – other than those taken from the preceding experiments – are presented in Appendix G.

Results

A 2x3 between subjects ANOVA was conducted, using stereotype threat (high vs. low) and message content (Church leaders only [message 1] vs. scientists only [message 2] vs. Church leaders and scientists [message 3]) as independent variables and AGW beliefs as dependent variables. Contrary to hypothesis 3, the main effect of stereotype threat was not significant: $F(1,213)=1.69$; $p=.20$; $\eta_p^2=.01$. Consistent with hypothesis 5, the interaction was significant: $F(2,213)=3.25$; $p=.04$; $\eta_p^2=.03$ (see Table 7).

Table 7

Belief in AGW as a Function of Stereotype Threat and Message in experiment 8

Stereotype Threat	
High	Low

	Message		
	1	3.86 (.64) a	4.06 (.64) a
	<hr/>		
Message	Message		
	2	4.15 (.64) a	3.97 (.55) a
	<hr/>		
	Message		
	3	4.17 (.64) a	3.80 (.89) b

Note: Standard deviations in parentheses. Postscripts denote significant differences (row-wise).

An analysis of simple effects revealed that high stereotype threat was associated with increased AGW endorsement relative to low stereotype threat for participants exposed to message 3: $F(2,213)=5.27$; $p=.02$; $\eta_p^2=.02$. However, this was not the case for participants exposed to message 1 ($F(1,213)=1.61$; $p=.21$) or message 2 ($F(2,213)=1.53$; $p=.22$). This pattern is consistent with the prediction that the effect of high (vs. low) stereotype threat in increasing endorsement of AGW would be observed for participants exposed to message 3 to a greater extent than for participants exposed to messages 1 or 2 (hypothesis 5). However, it is not consistent with the prediction that high (vs. low) stereotype threat would be associated with increased belief in AGW in all message conditions (hypothesis 3).

An additional 2x3 ANOVA was conducted to test the hypothesis that high (vs. low) stereotype threat would increase mean donations, particularly for participants exposed to message 3 (relative to those exposed to message 1 or 2). Contrary to hypotheses 6 and 7, the interaction and main effects all fell below significance ($F_s < 1$). Because no significant effects of stereotype threat on donations were detected, no mediation tests were conducted.

To test hypothesis 10 (that reported temperature would be correlated with belief in AGW under low, but not high, stereotype threat), a multiple regression was conducted. The dependent variable was belief in AGW; in the first block, perceived temperature and

stereotype threat (high vs. low) were entered as predictor variables; in the second block, the interaction term for these two predictor variables was added. In accordance with hypothesis 10, a marginally significant interaction was observed: $\beta=.473$; $t(215)=1.94$; $p=.05$. The main effect of temperature was significant, with higher temperatures associated with increased belief in AGW: $\beta=.15$; $t(215)=1.94$; $p=.05$. Moreover high stereotype threat was associated with significantly greater belief in AGW relative to low stereotype threat: $\beta=-.54$; $t(215)=2.22$; $p=.03$. This result is consistent with hypothesis 3 but conflicts with the ANOVA reported above, in which the main effect of stereotype threat was not significant. It appears that the effect of stereotype threat only reached significance when variance in belief in AGW attributable to perceived temperature and its interaction with stereotype threat was accounted for whilst the variance attributable to message content was not.

Analysis of the correlations between perceived temperature and belief in AGW were conducted for the different levels of stereotype threat. Consistent with hypothesis 10, under high stereotype threat, the correlation was not significant: $r(109)=-.02$; $p=.87$, whereas under low stereotype threat, the correlation was significant and positive: $r(106)=.27$; $p=.01$.

Discussion

The results of experiment 8 indicate that stereotype threat can interact with the content of a persuasive message to influence beliefs about AGW. High (vs. low) stereotype threat enhanced the tendency of religious Christians to accept the reality of AGW when exposed to a message emphasising agreement between Church leaders and Scientists on the urgent need to combat AGW. The stereotype threat manipulation did not have the same effect for participants who were exposed to messages emphasising the widespread agreement on this topic among Church leaders only or scientists only.

The direction of the interaction between stereotype threat and message content was consistent with hypothesis 6, which predicted that the enhancing effect of high (vs. low) stereotype threat on belief in AGW would be greater for participants exposed to message 3

relative to messages 2 or 1. However, the absence of any effect of stereotype threat for participants exposed to messages 2 and 1, and the consequent lack of a main effect of stereotype threat across message conditions, was inconsistent with predictions. Indeed, the interaction appeared to be driven by the fact that belief in AGW was lower in the low stereotype threat/message 3 cell relative to the other cells (see Table 7), whereas a hypothesis-confirming pattern would have involved higher belief in AGW in the high stereotype threat/message 3 cell relative to the other cells.

Nevertheless, a main effect of stereotype threat was observed in the multiple regression. Furthermore, the fact that perceived temperature correlated with belief in AGW under low – but not high – stereotype threat is consistent with hypothesis 10.

Experiment 9

Following experiment 8, which revealed an interaction between stereotype threat and persuasive message content in predicting beliefs about AGW, experiment 9 investigated whether the way in which a message is framed can interact with stereotype threat. Specifically, I examined the hypothesis (hypothesis 9) that a positively framed message about AGW (“successfully mitigating climate change will prevent harm to the environment”) would evoke more acceptance thereof compared to a negatively framed message about AGW frame (“failing to mitigate climate change will cause harm to the environment; Newman, Howlett, Burton, Kozup & Heintz Tangari, 2012). Moreover, I examined whether the effect of using a positive frame or a negative frame in a message about climate change would vary as a function of stereotype threat (hypothesis 10). A 2x2 experimental design was used, wherein stereotype threat (high vs. low) and message frame (positive vs. negative) were manipulated, with belief in AGW as the outcome variable.

As explained in the introduction, the interaction between message framing and stereotype threat was proposed to be independent of the content of the stereotype threat. Thus, rather than using a science-related stereotype, participants in experiment 9 were either

led to believe that people of their age group tended to perform worse on an ostensibly forthcoming test of cognitive ability (high stereotype threat) or were not told of any group differences in performance. A main effect of stereotype threat (with high stereotype threat associated with greater belief in AGW than low stereotype threat; hypothesis 4) and a main effect of message frame (with the positive frame associated with greater belief in AGW than the negative frame; hypothesis 9) were also predicted.

Method

Participants and Design

130 participants (36 females; mean age=35.9; SD=9.1) were recruited online via CrowdFlower, with no selection criteria applied on the basis of nationality. One participant was excluded because of dual participation. Participants (including those who were excluded from the analyses) were paid \$0.05 for their participation.

A 2x2 between-subjects experimental design was used, in which stereotype threat (high vs. low) and message frame (positive vs. negative) functioned as independent variables and belief in AGW functioned as a dependent variable.

Measures

The same measure of belief in AGW used in experiments 6 and 7 was employed ($\alpha = .867$).

Procedure

Participants were first asked to state their age and were told that they were about to complete a test of cognitive ability. Participants 35 years of age or above were either told that people above 34 years of age tended to perform worse on the forthcoming task (inducing high stereotype threat) or were told nothing about age differences in performance (inducing low stereotype threat). Participants 34 years of age or below were either told that people below 35 years of age tended to perform worse on the forthcoming task (inducing

high stereotype threat) or were told nothing about age differences in performance (inducing low stereotype threat).

All participants then read a message stressing the importance of taking action against climate change. In the positive frame condition, the message emphasised the positive consequences of successfully taking preventative action. In the negative frame condition, the message emphasised the negative consequences of failing to take preventative action. Participants then completed the measure of belief in AGW used in prior experiments.

The materials used in experiment 9 – other than those taken from the preceding experiments – are presented in Appendix H.

Results

A 2x2 ANOVA was conducted using stereotype threat (high vs. low) and message frame (positive vs. negative) as independent variables, with belief in AGW as a dependent variable. Means and standard deviations are displayed in Table 8.

Table 8

Belief in AGW as a Function of Stereotype Threat and Message Frame in experiment 9

		Stereotype Threat	
		High	Low
Message	Positive	4.13 (.57)	3.83 (.87)
Frame	Negative	3.97 (.67)	3.81 (.77)

Note. Standard deviations in parentheses.

Contrary to hypothesis 9, the main effect of message frame was not significant: $F(1,125)=.515; p=.474; \eta_p^2=.00$; . Nevertheless, consistent with hypothesis 3, there was a

marginally significant effect of stereotype threat: $F(1,122)=3.92$; $p=.08$; $\eta_p^2=.03$. As expected, belief in AGW was greater in the high stereotype threat cells ($M=4.07$; $SD=.61$) compared to the low stereotype threat cells ($M=3.82$; $SD=.81$). Contrary to hypothesis 9, the interaction was not significant ($F(1,125)=.31$; $p=.58$; $\eta_p^2=.00$).

Discussion

Contrary to hypothesis 9, the effect of positive vs. negative message framing did not vary as a function of stereotype threat. Moreover, contrary to hypothesis 8, there was no main effect of the framing manipulation on beliefs in AGW. However, the marginally significant effect of stereotype threat observed here is consistent with hypothesis 3, providing support for the view that people attempt to resolve stereotype threat-induced cognitive dissonance by expressing greater belief in AGW.

Experiment 10

Experiment 10 sought to investigate the interaction between temperature and stereotype threat in predicting belief in AGW. A 2x2 experimental design was employed wherein stereotype threat (high vs. low) and temperature (high vs. low) were manipulated, with belief in AGW as an outcome variable. Since it would be difficult to directly manipulate temperature in the context of an online study, the temperature manipulation involved exposure to heat-related or cold-related visual stimuli. This is in line with previous research (Wilkowski, Meier, Robinson, Carter, & Feltman, 2009) showing that the psychological effects of heat- and cold-related stimuli are similar to the effects of actual variations in temperature. It was hypothesised that exposure to high (vs. low) temperatures would trigger increased belief in AGW for participants subject to high stereotype threat, but not for participants subject to low stereotype threat (hypothesis 10).

Since experiments 5, 6, 7 and 8 had excluded American participants from their samples, experiment 10 also sought to examine whether the hypothesised main effect of stereotype threat would generalise to Americans. America is one of the largest carbon

emitters in the world and exerts an enormous influence in international politics, including in the area of climate change negotiations (Berger, Easterly, Nunn & Satyanath, 2013; Keohane, 2015). Moreover, a recent meta-analysis (Floret & Witcherts, 2014) found that stereotype threat effects tend to be weaker in American samples. As such, it was deemed important to determine whether the hypothesised effect of stereotype threat would be observed in an American sample. Participants for experiment 10 were therefore recruited exclusively from America.

Method

Participants and Design

100 American participants were recruited via CrowdFlower. Two participants were excluded for dual participation, leaving 98 participants (58 females). Participants (including those who were excluded from the analyses) were paid \$0.05 for their participation.

A 2x2 between-subjects experimental design was used, in which stereotype threat (high vs. low) and depicted temperature (hot vs. cold) functioned as independent variables and belief in AGW functioned as a dependent variable. Political orientation was used as a covariate.

Moreover, in a mixed design, stereotype threat (high vs. low) and a measure of perceived temperature (continuous) were used as independent variables, with belief in AGW as the dependent variable. Political orientation was used as a covariate.

Measures

The same AGW belief measure employed in previous experiments was used in experiment 10 ($\alpha = .945$). Temperature perceptions were assessed with a single item: "On a scale of 1 to 9, how hot do you feel right now? '1' indicates "extremely cold" and '9' indicates "extremely hot". Since experiment 10 used American participants, and since liberal/conservative political identification has been found to relate to belief in AGW to a

greater extent in America relative to other countries (McCright & Dunlap, 2011a), a measure of liberal/conservative political identification was taken prior to the experimental manipulations. Specifically, participants rated themselves on a scale of 1 (extremely conservative) to 9 (extremely liberal).

The materials used in experiment 10 – other than those taken from the preceding experiments – are presented in Appendix I.

Procedure

Participants first reported their political identification before being subject to the temperature manipulation, wherein they were asked to classify three images according to whether or not they contained an animal. The first two images (a cow and a brick wall) were the same for all participants. The third image depicted either a fire (high temperature condition) or a snowy forest (low temperature condition), each of which were devoid of animals.

Participants were then told that they were about to complete a test of scientific ability. In the high stereotype threat conditions, they were told that Europeans tended to outperform Americans on the test. This information was omitted in the low stereotype threat conditions. Finally, participants completed the measure of belief in AGW and the perceived temperature measure.

Prior to and following the belief in AGW measure, a number of other measures were administered (none of which were administered prior to the manipulations). However, since none of these other measures related to the hypotheses presented herein, they are not discussed below.

Results

A 2x2 ANCOVA was conducted, using temperature (high vs. low) and stereotype threat (high vs. low) as independent variables, with belief in AGW as a dependent variable

and liberal/conservative orientation as a covariate. Contrary to hypothesis 10, the interaction was not significant ($F(1,93)=0.00; p=.99$; see Table 9). The main effect of temperature was also not significant ($F(1,93)=.40; p=.53$). However, the main effect of stereotype threat was significant: $F(1,93)=4.03; p=.05; \eta_p^2=.04$. Consistent with hypothesis 4, belief in AGW (adjusted for liberal/conservative orientation) was higher for participants exposed to high stereotype threat ($M=4.09; SE=.13$) relative to those exposed to low stereotype threat ($M=3.73; SE=.12$).

Table 9

Belief in AGW (Adjusted for Liberal/Conservative Orientation) as a Function of Stereotype Threat and Message Frame in experiment 10

		Stereotype Threat	
		High	Low
Temperature	Low	4.15 (.20)	3.78 (.16)
	High	4.03 (.17)	3.67 (.19)

Note. Standard errors in parentheses.

When liberal/conservative orientation was not used as a covariate, neither the main effect of stereotype threat ($F(1,94)=.80; p=.37$), the main effect of temperature ($F(1,94)=.12; p=.73$) nor the interaction between them ($F(1,94)=.08; p=.78$) were significant.

To test the hypothesised stereotype threat*temperature interaction using the measure of perceived temperature, a multiple regression was conducted. Terms for the main effect of stereotype threat and the main effect of perceived temperature were entered into the first block, with the interaction term entered into the second block; belief in AGW was the dependent variable. Contrary to hypothesis 10, neither of the main effects nor the interaction

were significant ($F_s < 1$). This remained the case even when liberal/conservative orientation was used as a covariate.

Discussion

Contrary to hypothesis 10, high (vs. low) temperatures were not differentially associated with belief in AGW as a function of stereotype threat. The lack of either a main effect of temperature or an effect of temperature specific to the low stereotype threat condition appears to be inconsistent with previous research (Zaval et al., 2014) showing that high temperatures – in laboratory and naturalistic settings – are linked to increased belief in AGW. However, previous studies have either examined the effects of natural temperature variations or used manipulations that directly target temperature, whereas experiment 10 manipulated exposure to a heat-related or cold-related picture. Although some past research indicates that pictorial reminders of temperature can have similar psychological effects to actual temperature variation (e.g. heat triggering increased aggression; Wilkowski et al., 2009), this may not be the case for belief in AGW. Indeed, the pictures that are used to represent climate change in the media often depict very low-temperature scenes (e.g. struggling polar bears and melting ice caps; Slocum, 2004). It may be that cold-related images consequently make the pro-AGW narratives associated with such scenes more accessible, thereby countering the normal effect of cold temperatures in reducing belief in AGW. This would mean that the overall impact of the temperature manipulation used in experiment 10 would be null, regardless of stereotype threat condition. Thus, the failure of experiment 10 to provide confirmatory evidence for hypothesis 10 may simply be attributable to shortcomings in the temperature manipulation used therein.

However, it must also be noted that the measure of perceived temperature did not correlate with belief in AGW or interact with stereotype threat in predicting belief in AGW. The latter observation is inconsistent with hypothesis 10 and the results of experiment 8; the

former finding also conflicts with the results of experiment 8 as well as with extensive prior research showing that perceived and actual temperatures tend to correlate with belief in AGW (Zaval et al., 2014). Possible reasons for this discrepancy – including the difference between the measures of perceived temperature used in experiments 8 and 10 – are suggested in the general discussion.

The marginally significant main effect of stereotype threat observed in experiment 10, with high (vs. low) stereotype threat being associated with increased belief in AGW, is consistent with hypothesis 3. This supports the line of reasoning outlined in the introduction, wherein I argued that endorsing the scientifically correct position on AGW would be viewed as a way for people to resolve stereotype threat-induced cognitive dissonance.

General Discussion

Experiment 5 confirmed a central premise of the reasoning outlined in the introduction to chapter 3, namely that (non-)belief in AGW is generally perceived as indicative of scientific (in)competence. Across the other five experiments of chapter 3, fairly consistent evidence was found for the hypothesis that high (vs. low) science-related (or, in experiment 9, cognitive ability-related) stereotype threat would be associated with increased belief in AGW (hypothesis 3). Evidence for this prediction was found in experiments 6, 9, 10, and – in one of the two relevant analyses – experiment 8. However, no support for hypothesis 3 was found in experiment 7.

Moreover, experiments 6 and 7 supported the prediction that the effect of science-related stereotype threat on belief in AGW would be moderated by implicit theories of ability (hypothesis 4), such that only people induced to view scientific ability as a fixed entity (but not those induced to view it as a malleable construct) would be susceptible to the effect of science-related stereotype threat on belief in AGW.

Experiment 8 found that the enhancing effect of science-related stereotype threat on belief in AGW was greatest for participants exposed to a message that rendered AGW

endorsement an effective method for coping with stereotype threat, i.e. a message describing Church leaders and Scientists (rather than just Church leaders or just Scientists) as united in their perception of the urgent need to tackle AGW (hypothesis 5).

Similarly, experiments 9 and 10 failed to observe mediated effects on donations via AGW belief proposed in hypotheses 6 and 7, and they failed to find an effect of positive (vs. negative message frames) on AGW belief (hypothesis 8), significant interactions between stereotype threat and positive vs. negative message framing (hypothesis 9) and between stereotype threat and temperature (hypothesis 10). However, support for hypothesis 10 was observed in experiment 8.

Nevertheless, the present research constitutes - to my knowledge - the first evidence for the view that science-related stereotype threat can enhance belief in AGW. This idea has potential practical implications in terms of the need to communicate accurate information about AGW to the public. However, given the numerous undesirable outcomes that are associated with stereotype threat, particularly following chronic exposure (Appel & Kronberger, 2012; Schmader et al., 2008), the possibility of using it as a means to enhance public acceptance of AGW raises some ethical concerns. However, the idea that expressing belief in AGW is used to eliminate stereotype threat does help to counter the (unsubstantiated) claim made by some AGW deniers that “fear of anthropogenic “global warming” can adversely affect patients’ well-being” (Schulte, 2008, p.281). If, like other forms of stereotype disconfirmation (e.g. Marx & Roman, 2002; McIntyre et al., 2003), endorsement of AGW does indeed help to reduce stereotype threat, then it would follow that believing in AGW may have positive psychological consequences. Stereotype threat can lead to numerous physical and psychological problems (Burgess, Warren, Phelan, Dovidio, Van Ryn, 2010; Steele, 1997), and the alleviation thereof through belief in AGW may therefore be beneficial. Thus, the current findings challenge the unsubstantiated claims made by some AGW deniers (Schulte, 2008) that belief in AGW should be discouraged on the grounds of health concerns.

Moreover, the observation that implicit theories of ability can modulate the impact of stereotype threat on belief in AGW supports previous research showing that implicit theories of ability can also modulate stereotype threat's effects on academic performance and attitudes (Aronson, 1999; Aronson et al., 2002; Froehlich et al., 2016). The current work therefore provides further support for the notion that the induction of an increment theory of ability can be a useful intervention technique to reduce the impact of stereotype threat in cases where its effects are deemed to be negative.

Experiments 6 and 7 are, to my knowledge, the first studies examining the effects of stereotype threat on beliefs about AGW. Although a previous investigation revealed that priming conservative and liberal group identities leads to an accentuation of partisan differences in views on AGW (Unsworth & Fielding, 2014), this study focused on the effects of social identity activation rather than addressing the effects of negative stereotypes. Similarly, it has been postulated (but not empirically confirmed) that the stereotyping of climatologists as "alarmist" may lead to them to make unrealistically mild predictions about AGW in order to disconfirm the stereotype (Freudenburg & Muselli, 2010; Lewandowsky, Oreskes, Risby, Newell & Smithson, 2015). However, these authors did not speculate about the effect of stereotype threat on lay-people's belief in AGW. Thus, the present experiment constitutes the first empirical evidence that science-related stereotype threat can increase endorsement of the scientific consensus on AGW among entity theorists.

However, many of the trends in experiments 8, 9 and 10 were inconsistent with the relevant hypotheses. In experiments 9 and 10, interactions between stereotype threat and message framing or temperature were not observed, and in experiment 8 the simple effect of stereotype threat was not significant for participants exposed to message 1 or 2. It is difficult to explain this pattern of data. It is also noteworthy that the predicted effects on donation behaviour (hypotheses 7 and 8) were not observed in experiment 8. Given that belief in AGW has been found to be predictive of related environmentally friendly behaviours (Ferguson & Branscombe, 2010; Gifford, 2011; Jang, 2013), it is surprising that the impact

of the independent variables on belief in AGW was not mirrored by a similar pattern of effects on amount donated. One possible explanation for this is that belief in AGW has only a weak effect on corresponding behaviours, meaning that the indirect effect of the independent variables on the donation measure would have been too weak to detect. Indeed, evidence indicates that attitudes generally have only a small impact on relevant behaviours (Juvan & Dolnicar, 2014), and this finding has been replicated in studies examining attitude-behaviour links in the domain of climate change (Shove, 2010). It is therefore possible that the failure to find support for hypotheses 4, 7 and 8 is due to the fact that the indirect effect of experiment 8's independent variables on donation behaviour was too weak to detect.

Alternatively, it may be that belief in AGW had no causal impact on amount donated. Previous studies examining the link between belief in AGW and behaviours intended to prevent AGW have used behavioural measures that involve actions that directly reduce carbon dioxide emissions (e.g. reducing energy consumption; Ferguson & Branscombe, 2010), whereas experiment 8's behavioural measure assessed donations to an activist organisation involved in promoting accurate beliefs about AGW. Even participants who strongly believed in AGW may have been unwilling to donate to such an organisation, because environmentalist groups are often perceived as disseminators of far-left ideology (Hoffarth & Hodson, 2016).

Moreover, since participants were donating someone else's (i.e. the experimenter's) money, their donation behaviour may have been less reflective of their personal attitude towards AGW. Carlsson, Katari, Lampi and Levati (2011) found that when people were given the ability to decide lower limits for others' donations, their decisions were influenced by the extent to which they believed that those others supported the cause to which the donations were directed. Similarly, in experiment 8, participants' donation decisions may have been determined by their perception of the experimenter's support for the cause in question (which presumably would not have varied across conditions), rather than their own personal support for the cause. Future research should therefore investigate whether the

independent variables used in experiment 8 are capable of producing observable effects on AGW-related donation behaviour when participants are asked to donate their own money.

Similarly, the failures to find evidence for the proposed interactions between stereotype threat and message framing (experiment 9, hypotheses 8 and 9) and temperature (experiment 10, hypothesis 10) can be attributed to a number of possible factors. In experiment 9, although the negative message frame may have evoked more cognitive dissonance than the positive message frame (McMaster & Lee, 1991), it is possible that participants were able to resolve this cognitive dissonance without altering their beliefs about the reality of AGW – for instance, they may have convinced themselves that technological advances are likely to protect the world from any potential devastation that AGW might trigger (Lorenzoni, Nicholson-Cole & Whitmarsh, 2007). This would explain why no effect of message frame on belief in AGW was observed in either stereotype threat condition. Although this account appears to be inconsistent with research indicating that positively framed messages about climate change tend to evoke more pro-environmental intentions than negatively framed messages (Newman et al., 2012), it should be noted that Newman et al.'s (2012) research addressed the behavioural effects of framing, rather than its impact on beliefs about AGW. If people resolve the cognitive dissonance aroused by negatively framed messages about AGW by committing to the belief that technological advances will avert any problems arising from AGW, then they may consequently perceive environmentally friendly behaviour as redundant and may therefore experience a reduced desire to engage therein. This would mean that negatively framed messages about AGW could reduce environmentally friendly behaviour (relative to positively framed messages) without affecting belief in AGW. Thus, the failure to observe any effect of message framing in either stereotype threat condition in experiment 9 may be attributable to the fact that participants resolved the cognitive dissonance induced by the negative frame in a manner that allowed them to preserve their pre-existing level of belief in AGW. Future research

examining the impact of message framing on these dissonance-reducing beliefs would therefore be useful.

Alternatively, the hypothesised stereotype threat*message frame interaction may have been cancelled-out by an effect of regulatory fit on participants' beliefs about AGW. As noted in chapter 1, regulatory fit occurs when two features of a situation induce an individual to adopt the same regulatory focus (i.e. a prevention focus, wherein the goal is to minimise losses, or a promotion focus, wherein the goal is to maximise gains). Regulatory mismatch occurs when two features of a situation induce the individual to adopt different regulatory foci (i.e. when one situational feature induces a promotion focus and another induces a prevention focus; Chalabaev et al., 2009; Chalabaev et al., 2015; Förster et al., 2001; Grimm et al., 2009; Grimm et al., 2015; Seibt & Förster, 2004; Worthy et al., 2009). An extensive body of research demonstrates that persuasive messages are more effective when they contribute to regulatory fit rather than regulatory mismatch (Koenig, Cesario, Molden, Kosloff & Higgins, 2009). For instance, if participants are induced to adopt a promotion focus, they are more likely to be persuaded by an advert that focuses on the benefits to be gained from buying from the product, rather than the losses that will be avoided by buying it. Conversely, participants who are induced to adopt a prevention focus will respond more positively to a loss-focused, rather than a gain-focused, advert (Cesario et al., 2004; Lee & Aaker, 2004).

This principle would have been relevant in experiment 9, because stereotype threat and negative message frames both induce prevention foci (Lee & Aaker, 2004; Seibt & Förster, 2004). This would have meant that participants in the negative frame/high stereotype threat condition would have experienced regulatory fit. Since numerous studies have demonstrated that message persuasiveness is enhanced by regulatory fit (Cesario et al., 2004; Higgins, 2002; Koenig et al., 2009; Scholer & Higgins, 2008), the pro-AGW message may have been more effective in these conditions. This effect, which would have shifted belief in AGW up in the negative frame/high stereotype threat condition, may have

counteracted the hypothesised effect wherein the cognitive dissonance evoked by the negative (vs. positive) message frame triggered increased denial of AGW when stereotype threat was high. If both of these effects were in operation, then the mean belief in AGW in the negative frame/high stereotype threat condition would not have been expected to differ from the other conditions. This would explain why the hypothesised stereotype threat*message frame interaction – which required heightened belief in AGW in the negative frame/high stereotype threat condition – was not observed.

Likewise, there are a number of possible explanations for the failure of experiment 10 to confirm the hypothesised stereotype threat*temperature interaction. In the introduction, it was argued that individuals who were subject to stereotype threat would experience increased cognitive dissonance (Schmader et al., 2008), which would lead them to process information more carefully (Inzlicht et al., 2015). This increased cognitive effort was proposed to reduce the tendency to rely on irrelevant factors to judge the validity of AGW (such as current temperature or recent temperature trends; Petty, Wheeler & Bizer, 1999), thereby eliminating the effect of high (vs. low) temperature in enhancing belief in AGW among participants subject to high stereotype threat (hypothesis 10).

However, it is possible that this effect of the increased cognitive effort triggered by stereotype threat-induced cognitive dissonance was counteracted by the depleting effect of stereotype threat on working memory (Schmader & Johns, 2003). Working memory is a domain-general, capacity-limited cognitive resources that is required to inhibit automatic or habitual responses in favour of more deliberated judgements and behaviour (Anderson, 2002). Since stereotype threat reduces working memory capacity (Schmader & Johns, 2003; Beilock et al., 2007; Rydell et al., 2009), stereotype-threatened participants in experiment 10 may have had a diminished capacity to inhibit the habitual tendency to rely on current and recent local temperature trends to judge the validity of AGW (Zaval et al., 2014). Indeed, working memory depletion generally leads to increased reliance on heuristics and decreased usage of deliberative judgement strategies (Pohl, Erdfelder, Hilbig, Liebke & Stahlberg,

2013). Consequently, the reduced reliance on temperature cues caused by stereotype threat-induced cognitive dissonance may have been counteracted by working memory depletion, which would cause participants to rely more heavily on temperature cues. This would explain the failure of experiment 10 to find evidence of an interaction between stereotype threat and temperature in predicting belief in AGW.

This would also explain why the stereotype threat*temperature interaction failed to reach significance even when the measure (rather than the manipulation) of perceived temperature was used as an independent variable. However, it would not explain why, contrary to numerous previous studies (Li et al., 2011; Zaval et al., 2014), experiment 10 failed to find a main effect of either measured or manipulated temperature on belief in AGW. Moreover, the hypothesised stereotype threat*temperature interaction in experiment 8 *did* reach significance, along with the main effect of temperature on belief in AGW. The most plausible explanation for this discrepancy may be the difference between the measures of perceived temperature used in experiments 8 and 10. In experiment 8, participants were asked to rate both their current temperature and the long-term temperature change in their area, whereas in experiment 10 participants were only asked the former. Research indicates that perceptions of long term temperature change may be a more significant determinant of belief in AGW relative to current absolute temperature (Howe, Markowitz, Lee, Ko & Leiserowitz, 2013), which means that the measure in experiment 10 may have been incapable of capturing the necessary dimension of perceived temperature variability.

Limitations

A number of limitations apply to the experiments of Chapter 3. The exclusion of American participants in some experiments not only brings advantages but also limitations, given the powerful role played by the United States in international politics (Berger et al., 2013, 2013). The United States is one of the highest emitters of greenhouse gases in the world, but its population contains one of the highest global percentages of AGW deniers (McCright & Dunlap, 2011). Moreover, a large amount of misinformation on AGW

designed to encourage denial thereof originates from organisations based in the United States (Brulle, 2014). As such, research seeking to find ways to counter this misinformation should, from a practical perspective, be conducted in a manner that permits generalisation to the American population.

Furthermore, as noted above, the use of a pictorial temperature manipulation in experiment 10 may have undermined the capacity to detect an effect of temperature on belief in AGW. Pictorial manipulations of temperature (e.g. showing hot and cold pictures) sometimes have different effects to manipulations of physical temperature (e.g. varying the actual room temperature within the experimental setting; Murphy and Standing, 2014; although see Wilkowski et al., 2009), meaning that the use of such a manipulation in experiment 10 may have limited the capacity to infer the causal impact of actual variation in temperature on belief in AGW. Thus, future studies crossing manipulations of stereotype threat with manipulations of actual temperature would be useful.

Additionally, it should be noted that no inferences can be made on the basis of the current experiments about the relative effects of the different types of stereotype threat. According to Shapiro and Neuberg (2007), people who are exposed to negative ingroup stereotypes can experience a number of different forms of stereotype threat, which vary in terms of some of their specific effects. For instance, some forms of stereotype threat involve worrying about the prospect of demonstrating one's own incompetence (self-as-target stereotype threat), whereas other forms of stereotype threat involve worrying about the prospect of demonstrating that one's group is incompetent (group-as-target stereotype threat; Shapiro, 2011). Some forms of stereotype threat involve worrying about confirming personal or group incompetence from one's own perspective (self-as-source stereotype threat), whereas other forms of stereotype threat involve worrying about confirming personal or group incompetence from the perspective of others (other-as-source stereotype threat; Zhang, Schmader & Hall, 2013). In the current experiments, all of the stereotype threat manipulations employed procedures that have been demonstrated to induce the basic

cognitive, emotional and behavioural processes that are characteristic of all forms of stereotype threat (Schmader et al., 2008). However, it is difficult to determine the specific form of stereotype threat that would have been induced in the stereotype threat conditions of the current experiments. In other words, although one can be sure that *some* form of stereotype threat was induced as intended, it is unclear exactly *which* form of stereotype threat was induced.

Consequently, it is unclear whether the findings of the current experiments would be applicable to all forms of stereotype threat. For instance, Christians generally believe that non-Christians perceive their group as lacking scientific ability, but Christians themselves do not share this belief (Rios et al., 2015). Therefore, in experiments 7 and 8, it is unlikely that the Christian participants were worried about confirming the negative stereotype in their own minds (self-as-source stereotype threat), because they themselves would not have endorsed the stereotype. However, it is likely that they believed that other people (e.g. the experimenter) endorsed the negative stereotype, meaning that they may have been worried about confirming the stereotype from the experimenter's perspective (other-as-source stereotype threat; Shapiro, 2011). If this is correct, then it is possible that the results of experiments 7 and 8 would not generalise to situations in which self-as-source stereotype threat is induced. However, as Shapiro and Neuberg (2007) note, this is a problem that applies to most studies in the stereotype threat literature, because it is generally rare for experimenters to deliberately induce a specific form of stereotype threat. Nevertheless, future research should investigate whether or not the current findings are specific to a single form of stereotype threat. Indeed, one important goal of the studies presented in chapter 4 was to probe the potential different effects of different types of stereotype threat.

Conclusions

The current set of experiments provided fairly consistent evidence that exposure to science-related or cognitive ability-related stereotype threat leads to increased belief in AGW. Consistent with prior research (Aronson, 1999; Aronson et al., 2002) the results of

experiments 6 and 7 also indicated that this effect is modulated by implicit theories of ability, such that increment theorists' views of AGW do not change in response to stereotype threat. In experiment 8, a significant interaction between stereotype threat and persuasive message content was observed, indicating that the effects of stereotype threat on belief in AGW can be enhanced following exposure to certain messages. However, further research would be needed to fully understand the nature of the observed effects, and their underlying mechanisms.

Chapter Four: Do public self-consciousness, private self-consciousness, public self-awareness and private self-awareness interact with stereotype threat?

As noted in chapter 1, public self-consciousness is the dispositional tendency to attend to publicly observable aspects of the self (e.g. personal appearance), whereas private self-consciousness is the dispositional tendency to attend to internal thoughts, sensations and feelings (Fenigstein et al., 1975). Public and private self-awareness refer to the state versions of public and private self-consciousness, respectively. In other words, public self-awareness refers to the extent to which an individual is attending to publicly observable aspects of the self within a given situation; private self-awareness refers to the extent to which an individual is attending to internal thoughts and sensations within a given situation.

Chapter 3 sought to investigate the roles of public and private self-consciousness (experiments 11 and 12) and public and private self-awareness (experiment 13) in moderating the effects of stereotype threat. Although previous studies (Beilock et al., 2007) and theoretical models (Schmader et al., 2008) have explored the role of self-directed attention in stereotype threat, these papers have generally refrained from describing the nature of this self-directed attention in a manner that can be easily mapped onto constructs discussed in the self-consciousness and self-awareness literatures. For instance, Schmader et al. (2008, p. 343) propose that stereotype threat induces a “conscious and controlled state of monitoring the self within the situation”. This monitoring of the self is proposed to involve attending to information about other people’s endorsement of the negative stereotype (Brown & Pinel, 2003) and about how well one is performing the task (e.g. Forbes et al., 2008). It is also proposed to involve monitoring and attempting to consciously control one’s own behaviour in order to minimise mistakes (e.g. Beilock et al., 2006).

These processes are clearly similar to the attentional tendencies that characterise public and private self-awareness, which are two distinct dimensions (Govern & Marsch, 2001). However, it is unclear to what extent, if at all, the “monitoring of the self within the

situation” described by Schmader et al. (2008, p.343) corresponds to the ways in which public and private self-awareness are conceptualised in the relevant literature. For example, one might argue that the fact that stereotype threatened individuals attempt to monitor their own motor output (Beilock et al., 2006) indicates increased private self-awareness, given that private self-awareness involves attending to internal sensations (Govern & Marsch, 2001), some of which are likely to provide sensorimotor feedback about one’s own motor movements. Conversely, one might argue that motor movements can be consciously monitored by attending to sensory signals that are publicly visible (Wulf, 2013), such that the increased tendency to monitor one’s own motor output that characterises stereotype threatened individuals is indicative of enhanced public (not private) self-awareness. Thus, although it is clear that some forms of self-directed attention are activated under stereotype threat, existing theoretical models (Schmader et al., 2008) are not explicit in their claims about whether or not this self-directed attention should be considered the same as, similar to, or totally different from public or private self-awareness.

Experiments 11, 12 and 13 sought to address this issue by directly testing hypotheses about the roles played by public and private self-consciousness and self-awareness in the context of stereotype threat. Despite Schmader et al.’s (2008) proposals about the involvement of self-monitoring and performance-monitoring processes in the causal mechanisms of stereotype threat, there is currently no direct evidence to suggest that these processes should be considered identical to private or public self-awareness. However, there is evidence – presented below– to suggest that the effects of public and private self-consciousness may vary as a function of stereotype threat. Experiments 11 and 12 therefore addressed modulation of the effects of public and private self-consciousness by different types of stereotype threat . Specifically, experiment 11 investigated the extent to which different types of stereotype threat modulate the effects of public and private self-consciousness on perceptions of challenge and threat on a forthcoming task; experiment 12 investigated the extent to which the effect of these self-consciousness variables on the

tendency to engage in self-handicapping was modulated by different types of stereotype threat. Experiment 13 addressed the modulation of the effects of public and private self-awareness by stereotype threat.

Stereotype Threat, Self-Consciousness and Perceptions of Challenge and Threat

In chapter 1, it was argued that the trait activation principle (Tett & Guterman, 2000) is useful for the derivation of hypotheses about how public and private self-consciousness modulate the effects of different types of stereotype threat. The trait activation principle states that dispositional traits only tend to influence cognition, behaviour, and affect in trait-relevant situations. For instance, dispositional anxiety is only likely to influence anxious cognition, emotion, and behaviour in situations that the individual finds threatening (Tett et al., 2013).

Based on this principle, I reasoned that public self-consciousness would only influence thought, affect, and behaviour in situations where impression management concerns are present. Conversely, I expected that private self-consciousness would only influence thought, affect, and behaviour in situations where concerns about one's own private self-perception are present. Since other-as-source stereotype threat arises when the individual is concerned about how other people are perceiving them (an impression management concern; Shapiro & Neuberg, 2007), it follows that public self-consciousness should influence thought, affect, and behaviour in situations that trigger other-as-source stereotype threat. Moreover, since self-as-source stereotype threat arises when the individual is concerned about protecting their personal perception of their own ability level (Shapiro & Neuberg, 2007), it follows that private self-consciousness should affect thought, affect, and behaviour in situations that trigger self-as-source stereotype threat.

Geukes et al. (2012) used a similar line of reasoning in forming hypotheses about the role played by the two types of self-consciousness in the context of choking under pressure. Just as Shapiro and Neuberg (2007) propose that stereotype threat can arise when the individual fears confirming the negative stereotype within the minds of others (other-as-

source) or within their own mind (self-as-source), Geukes et al. (2012) argued that people can experience choking under pressure because of the need to impress other people (public pressure) or because of motivational needs that are independent of impression management concerns (private pressure). For instance, the presence of a large audience might induce public pressure because of the need to avoid appearing incompetent in front of the audience members (Mesagno et al., 2012), whereas instructions describing a task as ability diagnostic might induce private pressure by causing the individual to worry about cultivating a positive private self-image (Oulejans et al., 2015). The self-as-source vs. other-as-source distinction proposed by Shapiro and Neuberg (2007) is clearly similar to the private pressure vs. public pressure distinction proposed by Geukes et al. (2012): private pressure and self-as-source stereotype threat both involve concerns pertaining to the way in which the individual perceives themselves, whereas public pressure and other-as-source stereotype threat both involve concerns pertaining to the way in which the individual is viewed by others.

Based on the trait activation principle (Tett & Guterman, 2000), Geukes et al. (2012), proposed that public and private self-consciousness would differ in their relevance to situations involving public and private pressure. Public self-consciousness, which relates to dispositional impression management concerns (Sawaoka et al., 2012) would only be relevant to situations involving public pressure, in which such concerns are likely to be present. Private self-consciousness, which pertains to the way people reflect on their inner selves (rather than on the way other people perceive them), would only be relevant in situations in which private pressure is induced. On this basis, Geukes et al. (2012) argued that public self-consciousness would be expected to influence cognition, affect and behaviour in the context of public (but not private) pressure, whereas the reverse would be true for private self-consciousness. This led Geukes et al. (2012) to the non-directional hypothesis that private self-consciousness would be correlated with performance only in the context of private pressure, and that public self-consciousness would be correlated with performance only in the context of public pressure. The hypotheses were non-directional

because although the trait activation principle permits the derivation of predictions about when traits will and will not influence behaviour, it does not necessarily facilitate predictions about the *nature* of this influence. Geukes et al.'s (2012) results confirmed their predictions: public self-consciousness was (positively) correlated with performance in the context of high public (but not private) pressure, whereas private self-consciousness was (negatively) correlated with performance in the context of private (but not public) pressure.

It stands to reason that public and private self-consciousness should interact with the different types of stereotype threat in the same way as they interact with the different types of pressure as found by Geukes et al. (2012). In other words, consistent with the trait activation principle, public self-consciousness should only influence cognition, affect, and behaviour in the context of other-as-source (but not self-as-source) stereotype threat, whereas private self-consciousness should only influence cognition, thought, and behaviour in the context of self-as-source stereotype threat.

Experiment 11 tested this proposal using a design similar to that employed by Geukes et al. (2012). I manipulated type of stereotype threat (self-as-source vs. other-as-source) after measuring individual differences in public and private self-consciousness. Rather than focusing primarily on task performance, I used perceptions of a forthcoming task as a challenge or a threat (Blacovich, 2008) as the primary dependent variable of interest. Since other-as-source stereotype threat forces the individual to think about how they will be perceived by others (Shapiro & Neuberg, 2007), it follows that people who are well-accustomed to attending to the way in which others are perceiving them and adapting their behaviour to cultivate favourable impressions (i.e. highly publicly self-conscious individuals; Miller & Cox, 1982; Mohiyeddini et al., 2013) would feel more able to cope with the demands of situations that induce other-as-source stereotype threat. Since challenge arises when the individual believes that they have the resources to cope with situational demands (Blascovich et al., 2003), this means that public self-consciousness should be positively correlated with challenge in the context of other-as-source stereotype threat.

However, since the demands of situations involving self-as-source stereotype threat are independent of impression management concerns (Shapiro & Neuberg, 2007), I did not expect public self-consciousness to influence people's challenge or threat responses therein (hypothesis 11).

Using the same line of reasoning, I hypothesised that private self-consciousness would be positively correlated with challenge in the context of self-as-source stereotype threat, but not in the context of other-as-source stereotype threat (hypothesis 12). Privately self-conscious individuals would be well-accustomed to evaluating their own character traits and ability level (Trapnell & Campbell, 1999), and should therefore feel more familiar with the demands posed by a situation requiring them to protect their private self-image, such as a situation that evokes self-as-source stereotype threat. Consequently, private self-consciousness would be expected to correlate positively with challenge in the context of self-as-source stereotype threat. However, there would be no reason for it to correlate with challenge in the context of other-as-source stereotype threat.

In summary, two hypotheses were proposed. Public self-consciousness was predicted to correlate with challenge in the context of other-as-source stereotype threat, but not in the context of self-as-source stereotype threat (hypothesis 11). Moreover, private self-consciousness was predicted to correlate with challenge in the context of self-as-source stereotype threat, but not in the context of other-as-source stereotype threat (hypothesis 12).

In addition to these two hypotheses, a number of hypotheses about the relationship between the different types of stereotype threat, public and private self-consciousness and self-handicapping were developed.

Stereotype threat, Self-Consciousness and Self-Handicapping

Self-handicapping refers to the act of deliberately establishing obstacles (self-handicaps) that are likely to impair one's task performance in order to reap the attributional benefits provided by these obstacles (Baumeister, Hamilton & Tice, 1985; Berglas & Jones,

1978). For instance, by minimising the time spent practising for a task, an individual can allow their poor performance to be attributed to insufficient practice rather than low ability (Baumeister & Tice, 1990). Moreover, if performance is unexpectedly strong, then the resulting ability inference will be adjusted upwards to take account of the inimical effects of the self-handicap on performance (Kelley, 1971). In other words, a self-handicap ensures that strong performance will lead to attributions of high ability, whilst poor performance is less likely to be attributed to low ability. As such, self-handicapping serves an ego-defensive function for people who fear the prospect of demonstrating low ability (Tice, 1991).

A number of self-handicapping strategies have been identified, including consumption of performance impairing drugs (Berglas & Jones, 1978), insufficient practice (Baumeister et al., 1985; Stone, 2002), effort reduction (Chen, Wu, Kee, Lin & Shui, 2009), and the selection of disadvantageous performance environments (Rhodewalt & Davison, 1986). However, in addition to actively *creating* self-handicaps, the attributional benefits of self-handicapping can sometimes be obtained simply by *reporting* the presence of a factor that would be likely to harm one's performance. For instance, by claiming high levels of tiredness or anxiety, a person can help to ensure that poor performance is attributed to these factors rather than to low ability (Hirt, Deppe & Gordon, 1991). The two forms of self-handicapping described above are referred to in the literature as behavioural self-handicapping and reported self-handicapping (Chen, Chen, Lin, Kee, Kuo & Shui, 2008). I focused specifically on reported self-handicapping.

Reported self-handicapping could be used to cope with the impression management concerns aroused by stereotype threat, because the act of reporting the presence of a handicap – regardless of whether the handicap is genuinely present - can induce a favourable attributional tendency among others (Ferrari, 1991). However, the self-handicapping individual's knowledge of the handicap's (non-)existence would clearly be unaffected by the fact that they are reporting the handicap to others (Chen, et al., 2008). Therefore, reported self-handicapping would only be expected to enhance other people's

perceptions of the ability level of the individual engaging therein; the individual's perception of his/her own ability level would not be affected by reported self-handicapping. As such, reported self-handicapping would be a useful strategy for an individual seeking to enhance other's perception of their ability, but it would not be useful for an individual seeking to enhance their own perception of their ability level.

Note that the utility of reported self-handicapping for cultivating favourable ability impressions among others is not dependent on the actual existence of the handicap. If the handicap exists, then making others aware of its existence (as opposed to refraining from making them aware of its existence) would enhance the ability attributions made by these others. Similarly, if the handicap does not in fact exist, then deceptively telling others that it does exist (as opposed to refraining from telling others that it exists) would enhance these others' ability attributions (Chen et al., 2008). However, in neither case would the act of reporting the handicap affect the individual's self-perceived ability, because they would know about the existence or non-existence of the handicap regardless of whether they had reported it to others (Chen et al., 2008).

Experiment 12 specifically examined reported self-handicapping as an outcome variable. Since reported self-handicapping enables the individual to enhance others' impression of their ability without necessarily improving their level of self-perceived competence (Hirt et al., 1991), I expected other-as-source stereotype threat to trigger increased reported self-handicapping relative to self-as-source stereotype threat. Other-as-source stereotype threat involves a fear of displaying low personal or ingroup ability to other people, whereas self-as-source stereotype threat involves a fear of displaying low ability to oneself (Shapiro & Neuberg, 2007). Since reported self-handicapping can only enhance others' perception of one's abilities (without enhancing one's own perception of one's own abilities), it would help to advance the goals of individuals who were subject to other-as-source (but not self-as-source) stereotype threat. For this reason, I predicted that inducement

of other-as-source stereotype threat would trigger increased reported self-handicapping relative to inducement of self-as-source stereotype threat (hypothesis 13).

In line with the trait activation principle (Tett & Gutterman, 2000), it was also predicted that public self-consciousness would be correlated with the tendency to engage in reported self-handicapping in the context of other-as-source, but not self-as-source, stereotype threat. Since public self-consciousness reflects a tendency to attend to the way the self is perceived by others, it follows that people who are high in public self-consciousness would feel a greater need to employ image-protection strategies under other-as-source stereotype threat compared to people who are low in public self-consciousness. However, under self-as-source stereotype threat, outward image protection concerns would be weaker regardless of an individual's level of public self-consciousness, because situations that evoke other-as-source stereotype threat are unlikely to present the possibility of public evaluation (Shapiro & Neuberg, 2007). As such, there would be no reason to engage in reported self-handicapping under self-as-source stereotype threat, irrespective of one's level of public self-consciousness. Thus, it was hypothesised that public self-consciousness would correlate positively with reported self-handicapping for participants who were subject to other-as-source stereotype threat, but not for those subject to self-as-source stereotype threat (hypothesis 14).

Experiment 12 also examined the correlation between private self-consciousness and reported self-handicapping under different types of stereotype threat. Private self-consciousness was not hypothesised to correlate with reported self-handicapping under either form of stereotype threat. High private self-consciousness involves a tendency to attend to aspects of the self that are not subject to public observation, such as internal thoughts and feelings (Fenigstein et al., 1975). Since reported self-handicapping only serves to enhance the image of the self from the perspective of others (and not from one's own perspective), there is no reason to expect that private self-consciousness would be correlated with reported self-handicapping under any form of stereotype threat. Because essentially this

idea involved the prediction of a null-effect, I refrained from formally posing a hypothesis but nevertheless inspected the relevant statistical pattern in the data from experiment 12.

In summary, it was hypothesised that other-as-source stereotype threat would induce an increased tendency to engage in reported self-handicapping relative to self-as-source stereotype threat (hypothesis 13). It was also hypothesised that public self-consciousness would be positively correlated with reported self-handicapping when other-as-source stereotype threat is induced, but not when self-as-source stereotype threat is induced (hypothesis 14); no such interaction was hypothesised with respect to private self-consciousness. These hypotheses were tested in experiment 12.

Stereotype Threat, Self-Awareness and Motor Task Performance

In addition to investigating the interactions between the different types of stereotype threat and public and private self-consciousness, I also sought to explore the moderation of the effects of stereotype threat by public and private self-awareness. Public self-awareness is the state version of public self-consciousness; it refers to the extent to which a person is focused on publically observable aspects of the self within a given situation. Private self-awareness is the state version of private self-consciousness; it refers to the extent to which a person is focused on internal thoughts and sensations within a given situation (Govern & Marsch, 2001). I noted in the introduction that some of the aspects of the psychological profile that emerges following exposure to stereotype threat are similar to the attentional tendencies that characterise public and private self-awareness. For instance, in the context of other-as-source stereotype threat, individuals exhibit an increased desire to avoid displaying low ability to others (Zhang et al., 2013), which mirrors the finding that public self-awareness is associated with the desire to create favourable impressions on others (Wiekens & Staple, 2010). Likewise, stereotype threat induces a tendency to monitor the content of one's own thoughts in order to suppress unwanted material (Schmader et al., 2008), which mirrors the tendency of individuals in a privately self-aware state to focus on the content of their own thoughts (Govern & Marsch, 2001). However, there is also reason to believe that

the psychological consequences that can be triggered by stereotype threat are not entirely overlapping with those described in the literature on self-awareness (Beilock et al., 2006; Schmader et al., 2008).

Stereotype Threat as a moderator of the effects of public and private self-awareness

I will argue that public and private self-awareness are likely to influence performance on motor tasks in the context of high stereotype threat.

Effortfully monitoring one's own motor output hampers the operation of the automatic processes that typically guide skilled motor movements, thereby impairing performance (Beckmann et al., 2013). However, evidence indicates that, in some cases, consciously monitoring one's own motor output may in fact be conducive to strong performance (Lohse, Jones, Healy & Sherwood, 2014; Lohse, Sherwood & Healy, 2014). Specifically, research conducted by Wulf (e.g. Wulf, Landers, Lewthwaite, & Töllner, 2009; see Wulf, 2013 for a review) indicates that performance is impaired when people are instructed to monitor the internal sensations associated with their movements (e.g. the position of their feet as they attempt to balance on an unstable object), but performance is enhanced when people are instructed to monitor the effects of their movements on the world external to their body (e.g. the position of an unstable object on which they are attempting to balance; Wulf et al., 2009). Monitoring the internal sensations associated with one's motor output is referred to as internal attention; monitoring the external effects of one's actions is referred to as external attention (Wulf, 2013).

Given that private self-awareness is associated with attending to internal thoughts, feelings, and sensations (Govern & Marsch, 2001), it stands to reason that in the context of stereotype threat, individuals in a privately self-aware state would monitor their own motor output by attending to the internal sensations that it produces. Since internal attention is detrimental to motor task performance (Wulf, 2013), it follows that high private self-awareness should be associated with inferior performance in the context of stereotype threat.

Conversely, given that public self-awareness is associated with a tendency to monitor the aspects of the self that are observable to others (Govern & Marsch, 2001), it stands to reason that individuals in a publicly self-aware state would monitor their own motor output by attending to its effects on their external environment in the context of stereotype threat. Since external attention is conducive to strong motor task performance (Wulf, 2013), it follows that high public self-awareness should be associated with superior performance in the context of stereotype threat. However, when stereotype threat is absent, the tendency to monitor one's own motor output (whether by attending to internal sensations or external effects) would be diminished. Therefore, private and public self-awareness would be unrelated to the way in which monitoring of motor output is undertaken (because no such monitoring would be occurring), and would therefore be unrelated to performance. In summary, it was predicted that high public self-awareness (vs. high private self-awareness) would be associated with superior performance on a motor task for individuals subject to high stereotype threat, but not for those subject to low stereotype threat (hypothesis 15).

Summary of Hypotheses

In summary, the following predictions were tested. Public self-consciousness would correlate positively with perceptions of a forthcoming task as a challenge (not threat) when other-as-source stereotype threat was induced, but not when self-as-source stereotype threat was induced (hypothesis 11). Private self-consciousness would correlate with perceptions of a forthcoming task as a challenge (and not as a threat) when self-as-source was induced, but not when other-as-source stereotype threat was induced (hypothesis 12). Other-as-source stereotype threat would be associated with increased reported self-handicapping relative to self-as-source stereotype threat (hypothesis 13). Public self-consciousness would correlate positively with reported self-handicapping when other-as-source stereotype threat was induced, but not when self-as-source stereotype threat was induced (hypothesis 14). Public self-awareness would be associated with superior performance relative to private self-awareness, but only under high (but not low) stereotype threat (hypothesis 15).

Experiment 11

Experiment 11 employed a mixed experimental design: type of stereotype threat (self-as-source vs. other-as-source) was manipulated, and public and private self-consciousness were measured prior to the manipulation. Participants' perceptions of a forthcoming task as a challenge were then measured. This design was intended to test the hypothesis that public self-consciousness would correlate positively with perceptions of challenge for a forthcoming task under other-as-source, but not under self-as-source, stereotype threat (hypothesis 11). It was also hypothesised that private self-consciousness would be correlated with challenge perceptions under self-as-source, but not other as source, stereotype threat (hypothesis 12).

Method

Participants and Design

108 participants (43 females) participated via CrowdFlower. Participants were paid \$0.05 for their participation.

Procedure

Participants first reported their gender and then completed the public (7 items, $\alpha = .72$) and private (10 items, $\alpha = .52$) Self-Consciousness Scale (Fenigstein et al., 1975). Example items are “One of the last things I do before I leave my house is look in the mirror” (public self-consciousness) and “I'm generally attentive to my inner feelings” (private self-consciousness). Participants rated the extent to which each statement was true of them on a scale of 1 (not at all true of me) to 5 (very true of me). Item responses were averaged for each scale to calculate an overall score between 1 and 5 for each subscale.

Participants were then randomly assigned to the self-as-source or other-as-source stereotype threat conditions. All participants were told that they were about to take a test of cognitive ability, and that their gender tended to perform worse on this test as a result of its

lower average ability level. This has previously been found to be an effective way of inducing stereotype threat (Smith & White, 2002; Chalabaev et al., 2008). Participants in the self-as-source condition were told that, after the test finished, they would see how well they had performed and would thereby be able to see whether their performance had been in line with what was typical of their gender. Participants in the other-as-source condition were told that, after the test finished, the experimenters would calculate their score in order to determine whether their performance had been typical of what was expected of their gender. These instructions thereby served to orient participants towards thinking about how their performance would influence their own private self-perception of their own and their gender's ability level (self-as-source condition), or towards thinking about the experimenters' perception of their ability level and that of their gender (other-as-source condition).

Following the experimental manipulation, a 6-item measure of challenge and threat perceptions of the forthcoming test based on Drach-Zahavy and Erez (2002) was administered. An example item was "To me, the test seems like a challenge". Participants rated their agreement with each item on a scale of 1 (strongly disagree) to 5 (strongly agree); half of the items were reverse coded ($\alpha = .57$). Scores across items were averaged to form an overall score between 1 (low challenge/high threat) to 5 (high challenge/low threat).

The materials used in experiment 11 – other than those taken from the preceding experiments – are presented in Appendix J.

Results

Condition and public-self-consciousness were entered into the first block of a multiple regression; the interaction term was entered into the second block. The outcome variable was challenge perceptions. The beta for the interaction term was marginally significant: $R^2 = .03$, $\beta = -.96$; $t(1,104) = 1.83$; $p = .07$.

However, the pattern of results was not in line with predictions. Contrary to hypothesis 11, there was a marginally significant correlation between public self-consciousness and challenge perceptions in the self-as-source condition ($r(54) = .24$; $p = .07$), but no such correlation was observed in the other-as-source condition: $r(50) = -.10$; $p = .46$.

In a second multiple regression, condition and private self-consciousness were entered into the first block, the interaction term was entered into the second block and challenge perceptions were used as the outcome variable. Contrary to hypothesis 12, the interaction was not significant: $\beta = -.10$; $t(1,104) = -1.1$; $p = .28$.

Discussion

Contrary to the hypotheses, public self-consciousness was correlated at marginal significance with challenge perceptions in the self-as-source stereotype threat condition, but not in the other-as-source stereotype threat condition. Moreover, there was no significant interaction between private self-consciousness and type of stereotype threat in predicting challenge perceptions.

It is possible that the failure to observe the expected results is attributable to the inaccuracy of the experimental hypotheses. In the introduction to experiment 11, I reasoned that individuals who are high in public self-consciousness would be used to attending to their public appearance, making them feel better prepared for situations that involve managing public impressions (such as situations that trigger other-as-source stereotype threat; Neuberg & Shapiro, 2007). Likewise, I argued that individuals high in private self-consciousness would be used to thinking about their personal characteristics (Campbell & Trapnell, 1999) and would therefore feel better prepared for situations involving concerns about damaging one's own private self-perception (such as situations that trigger self-as-source stereotype threat; Shapiro & Neuberg, 2007). This sense of preparedness was proposed to engender increased perceptions of challenge (rather than threat; Blascovich et al., 1999).

However, there may have been a flaw in this line of reasoning. Although individuals in public self-consciousness would have had more experience with situations in which they were attending to their own public image (Geukes et al., 2012), this would not necessarily make them feel better prepared for these situations. For instance, depressed individuals are more likely to have experienced major negative events in the past (Monroe & Hidjiyannakis, 2002), and they are more likely to attend to negatively valenced stimuli (Gotli, Krasnoperova, Yue & Joorman, 2004). Nevertheless, these individuals do not feel more confident about their capacity to deal with negative events – on the contrary, they tend to doubt their own capacity to deal with unpleasant situations (Nolen-Hoeksma et al., 2000). For similar reasons, individuals who are high in public self-consciousness may not necessarily feel well-prepared for situations involving public impression management concerns, in spite of their increased experience of such situations. For instance, although they may have well-rehearsed strategies for dealing with these situations (e.g. by regulating body language; Sawaoka et al., 2012), they may also feel more anxious about the prospect of displaying an unfavourable public image, leading to increased threat perceptions (Blascovich, 2008). In experiment 11, these two separate effects of public self-consciousness – increasing preparedness of situations involving public impression management whilst simultaneously enhancing anxiety over the prospect of displaying a negative self-image therein – may have cancelled each other out. This would explain why there was no significant correlation between public self-consciousness and challenge perceptions under other-as-source stereotype threat, and no significant interaction between public self-consciousness and type of stereotype threat. Future research should investigate this possibility by directly measuring the extent to which public self-consciousness impacts perceived familiarity and anxiety in situations that evoke other-as-source stereotype threat.

Similarly, the absence of a significant interaction between private self-consciousness and type of stereotype threat in experiment 11 could be attributable to the fact that self-perception concerns may have been relevant in both the self-as-source and other-as-source

stereotype threat conditions. In the self-as-source condition, participants were told that they would be able to evaluate the stereotype-consistency of their own performance following the test, which would be expected to cause participants to worry about preserving a favourable self-perception (which was the intended purpose of the instructions in this condition; Shapiro & Neuberg, 2007). In the other-as-source condition, participants were told that the “experimenters” would evaluate their ability level. Although this would presumably have activated concerns with public impression management (as intended; Shapiro & Neuberg, 2007), participants may nevertheless have believed that they themselves would also be able to assess their own performance. Indeed, people typically expect to receive feedback following task performance (Dowden et al., 2013), and even if explicit feedback is not provided they are likely to monitor their own thoughts and behaviour to assess the quality of their performance (Beilock et al., 2007; Schmader et al., 2008). This means that participants in the other-as-source condition of experiment 11 may have expected that they would be able to evaluate their own performance, which would have activated private self-perception concerns. If, as argued in the introduction, private self-consciousness is associated with a belief that one is capable of dealing with the demands of situations that involve private self-perception concerns, then it would follow that private self-consciousness would be correlated with challenge perceptions under both self-as-source and other-as-source stereotype threat. This might explain the null-results obtained in the study.

Experiment 12

Experiment 12 sought to test the hypothesis that other-as-source stereotype threat would be associated with increased reported self-handicapping relative to self-as-source stereotype threat (hypothesis 13). It also sought to test the hypothesis that public self-consciousness would correlate positively with reported self-handicapping when other-as-source stereotype threat was induced, but not when self-as-source stereotype threat was induced (hypothesis 14).

Method

Participants

470 participants were recruited via CrowdFlower, of which 7 were excluded due to dual participation. 165 of the remaining 463 participants were female.

Measures

Public and Private Self-consciousness. Experiment 12 used the same measures of public ($\alpha = .60$) and private self-consciousness ($\alpha = .65$) as were employed in experiment 11.

Tiredness and Anxiety. Participants were asked to rate how tired and anxious they felt in two questions with responses ranging from 1 (not at all tired/anxious) to 7 (extremely tired/anxious). The order of these two questions was randomised across participants. Responses to the two questions ($r(461) = .37$; $p = .001$) were averaged to obtain an overall measure of self-reported tiredness and anxiety. The extent to which the impact vs. no impact manipulation (see procedure below) affected scores on this measure was used to index self-handicapping.

Procedure

Experiment 12 used a similar design to experiment 11 – participants completed measures of public and private self-consciousness before being subject to the stereotype threat manipulation (self-as-source vs. other as-source). However, the perceived challenge measure in experiment 11 was replaced with a procedure designed to assess reported self-handicapping tendencies. Specifically, participants completed the measure of anxiety and tiredness, with some participants being told that tiredness and anxiety had been found to be detrimental to performance on the forthcoming task (impact conditions), and other participants being told that these states would not affect their performance (no-impact conditions). Given that tiredness and anxiety would only serve as potential handicaps if they were perceived as obstacles to strong performance, participants seeking to engage in

reported self-handicapping would express greater tiredness and anxiety in the impact conditions, but not in the no-impact conditions. Thus, experiment 12 inferred participants' degree of reported self-handicapping by assessing how the effect of the impact vs. no impact manipulation varied as a function of the other independent variables. This method of assessing reported self-handicapping has been used in numerous previous studies (e.g. Berglas & Jones, 1978; Hirt et al., 1991; Hirt, McCrea & Kimble, 2000).

Due to this feature of the experimental design, hypotheses 13 and 14 led to predictions of a two-way and three-way interaction, respectively. Hypothesis 13 led to the prediction that reported tiredness and anxiety would be higher in the impact (vs. no-impact) conditions, but only when other-as-source stereotype threat (and not self-as-source stereotype threat) was induced. Hypothesis 14 led to the prediction that public self-consciousness would be correlated with reported tiredness and anxiety in the impact conditions (but not the no-impact conditions), but only when other-as-source stereotype threat was induced; under self-as-source stereotype threat, the correlation between public self-consciousness and reported tiredness and anxiety was not predicted to vary across the impact vs. no impact conditions.

The materials used in experiment 12 – other than those taken from the preceding experiments – are presented in Appendix K.

Results

A multiple regression was conducted, with anxiety and tiredness as the independent variable. Terms for the main effects of public self-consciousness, type of stereotype threat and ostensible impact of anxiety and tiredness were entered into the first block; terms for the three two-way interactions between these independent variables were entered into the second block and the three-way interaction term was entered into the third block. Contrary to hypothesis 13, there was no significant interaction between type of stereotype threat and

ostensible impact of tiredness and anxiety $t(455)=-.93$; $p=.35$. Contrary to hypothesis 14, there was no significant three-way interaction between public self-consciousness, type of stereotype threat and ostensible impact of tiredness and anxiety: $t(455)=34$; $p=.74$.

In a separate multiple regression, the same steps outlined above were repeated, except that public self-consciousness was replaced with private self-consciousness in all the main effect and interaction terms. Consistent with predictions, none of the main effects or interactions were significant.

Discussion

Contrary to hypothesis 13, no interaction between type of stereotype threat and ostensible impact of tiredness and anxiety was observed, indicating that the tendency to engage in reported self-handicapping did not differ as a function of stereotype condition. Moreover, contrary to hypothesis 14, there was no three-way interaction between public self-consciousness, type of stereotype threat and ostensible impact of tiredness and anxiety, indicating that the relationship between public self-consciousness and tendency to engage in reported self-handicapping did not vary as a function of stereotype threat condition. Thus, neither hypothesis was supported by the results of experiment 12.

It is possible that the failure to find supporting evidence in experiment 12 is attributable to the nature of the “type of stereotype threat” manipulation employed therein (this would also explain the unexpected patterns observed in experiment 11). Hitherto, no previous studies have used a manipulation to create self-as-source stereotype threat and other-as-source stereotype threat conditions, meaning that the manipulation used in experiment 12 was constructed without reference to an empirically validated template. It is therefore possible that the manipulation failed to achieve its intended goal, namely to induce a concern with validating the negative stereotype from the perspective of others (other-as-source condition) or from the participant’s own perspective (self-as-source condition).

Indeed, the other-as-source stereotype threat condition attempted to induce a concern with the prospect of validating the negative stereotype from the perspective of an anonymous group of experimenters referred to very briefly as “we”. Although previous studies have demonstrated that participants generally seek to convey favourable impressions about themselves and their ingroup to experimenters (Johns et al., 2008; Stone, 2002; Stone & McWhinnie, 2008; Zhang et al., 2013), the experimenters in these experiments were physically present and interacted with participants. Conversely, the online participants in experiment 12 had no direct exposure to the “experimenters”, and may therefore have been unconcerned by the prospect of making a negative impression on them. Indeed, evidence indicates that people are more concerned about cultivating favourable attitudes among others who are physically or psychologically close rather than distant (Milgram, 1974; Latane, 1981). It is therefore possible that participants in the other-as-source condition were not concerned about the impression made by their test performance on the physically and psychologically distant “experimenters”, and that they consequently experienced no other-as-source stereotype threat. This would explain the failure to observe hypothesis-confirming patterns in the present experiments, which both used the same manipulation of type of stereotype threat.

However, it may be that the failure to confirm the hypotheses is attributable to a problem with the hypotheses themselves. For instance, although individuals who are high in public self-consciousness may be more concerned with the need to display high personal or ingroup ability to others (Baumeister, 1984; Mesagno et al., 2012), they are also likely to be more concerned with the need to create a favourable impression on others in domains that are independent of ability (e.g. being perceived as likeable and attractive; Fenigstein et al., 1975; Sawaoka et al., 2012). Since reported self-handicapping tends to induce others to view the individual engaging therein as more competent but less likeable (McCrea et al., 2008), it may be that individuals high in public self-consciousness perceive reported self-handicapping to confer both greater benefits (because they value its capacity to enhance

others' impressions of their ability) and greater costs (because they fear its capacity to damage others' impressions of their likeability). They may consequently perceive no net benefit to self-reported handicapping, such that they would be neither more likely nor less likely to engage therein in situations that involve public impression management concerns (such as other-as-source stereotype threat). This would explain the lack of effects for public self-consciousness on a tendency to engage in reported self-handicapping in experiment 12.

It is unclear why individuals subject to other-as-source stereotype threat did not exhibit more reported self-handicapping relative to those subject to self-as-source stereotype threat, given that only other-as-source stereotype threat would be expected to induce a desire to evoke favourable ability attributions in others. One possibility – other than the ineffectiveness of the stereotype threat source manipulation mentioned above – is that the distinction between self-as-source stereotype threat and other-as-source stereotype threat proposed by Shapiro and Neuberg (2007) simply does not exist. Although studies in which participants are asked to report the thoughts and feelings that they experienced while under stereotype threat have indicated that people do focus to varying degrees on managing their own impressions or the impressions formed by others (Shapiro, 2011), these studies are limited in that people's introspective reports of the psychological processes underlying their behaviour are often highly inaccurate (Bryce & Bratzke, 2007; Clark, Luguri, Ditto, Knobe, Shariff & Baumeister, 2014). To my knowledge, experiments 11 and 12 were the first to attempt to experimentally manipulate the “source” dimension of stereotype threat. Their failure to produce hypothesis-confirming results and the absence of any other experimental evidence supporting the notion that stereotype threat can take on “other-as-source” and “self-as-source” forms questions the extent to which this distinction has any meaningful significance for the theoretical understanding of stereotype threat.

Indeed, evidence indicates that people's beliefs, including their beliefs about themselves and their ingroups, are heavily influenced by the views of others (Asch, 1956; Cialdini, 2001; Ritsher & Phelan, 2004). Conversely, people tend to over-estimate the extent

to which the views of others accord with their own (the false consensus effect; Ross, Greene & House, 1977; Welborne, Gunter, Vezich & Lieberman, 2017). Consequently, an individual seeking to enhance their own perception of their ability level would also have an incentive to cultivate favourable impressions of their ability among others, because the knowledge that others view them as having higher ability would make it easier for the individual to accept that this view is accurate (Cialdini, 2001). Likewise, an individual seeking to cultivate favourable impressions of their ability among others would also have an incentive to convince themselves of their own high ability level – by doing so, they would increase their own inclination to believe that others share their view due to the false consensus effect.

This consideration blurs the theoretical boundary between other-as-source and self-as-source stereotype threat, because it indicates that the motivational tendencies characterising each form of stereotype threat are likely to co-occur. This would mean that other-as-source and self-as-source stereotype threat would be unlikely to arise in isolation (i.e. it would be very rare to experience one without the other), except under very artificial circumstances that would be unlikely to occur in ecologically valid settings (e.g. when taking a test for which only the test-taker will know the score; Inzlicht & Ben-Zeev, 2003). As such, the self-as-source vs. other-as-source stereotype threat distinction may be of minimal theoretical and practical utility.

Nevertheless, it is important to bear in mind that the null results of experiments 11 and 12 only mean that the relevant alternative hypotheses cannot necessarily be accepted; they do not mean that the null hypothesis (that the source of stereotype threat has no meaningful impact) *should* be accepted. Thus, further evidence would be required before it will be possible to establish that the self-as-source vs. other-as-source distinction is of no meaningful significance. Regardless, the burden of evidence rests on the theorists seeking to claim that the self-as-source vs. other-as-source distinction *is* a theoretically useful one – in the absence of such evidence, this theoretical utility cannot be assumed.

Experiment 13

Having explored interactions between stereotype threat and the different forms of self-consciousness, experiment 13 investigated stereotype threat's interaction with public and private self-awareness. A 2x2 experimental design was used, wherein stereotype threat (high vs. low) and self-awareness (public vs. private) were manipulated, with performance on a motor task as the dependent variable. As well as being manipulated, self-awareness was also measured prior to the motor task. Following the motor task, a test was administered to assess the extent to which participants had employed internal or external attention during the task. It was hypothesised that public self-awareness would be associated with superior performance relative to private self-awareness, but only under high (but not low) stereotype threat (hypothesis 15).

Method

Participants

80 Psychology students at Royal Holloway University (70 females) participated in exchange for course credit.

Measures

Motor task performance. Following Baumeister (1984), motor performance was assessed using the 'roll-up' game, which requires the player to adjust the position of two metal rods in order to guide a ball into a target area (See: <https://www.youtube.com/watch?v=HnZuuCCdJAA>).

Participants completed this task twice: once during a practice phase and once during a test phase. During the practice phase, participants had 20 attempts to get the ball as close to the target area as possible. There were six positions in which it was possible for the ball to land. Participants gained 1 point if the ball landed in the farthest position from the target, 2 points for the second farthest position, 3 points for the third farthest position etc. The average score across all 20 trials was then calculated for each participant to create a single

score for the practice task, of which the highest possible value was 6 and the lowest possible value was 1. Participants were told that this was just a practice phase and that they should not worry about how well they performed.

In the test phase, the scoring system was the same as in the practice phase. However, unlike in the practice phase, in the test phase participants were told about the scoring system and were asked to make their best effort to obtain a high score.

Public and Private Self-Awareness. Govern and Marsch's (2001) Situational Self-Awareness Scale was used to measure public ($\alpha = .84$) and private self-awareness ($\alpha = .76$). The scale contains 3 items for each type of self-awareness. Example items are "Right now, I am conscious of my inner feelings" (private self-awareness) and "Right now, I am self-conscious about the way I look" (public self-awareness). Responses were given on a scale of 1 (strongly disagree) to 7 (strongly agree).

An average score for each subscale was calculated, after which the private score was subtracted from the public score in order to produce a variable on which higher scores indicated predominant public self-awareness whilst lower scores indicated predominant private self-awareness. For simplicity, this variable will henceforth be referred to as predominant public self-awareness.

This measure served two purposes. First, it was used as a manipulation check to determine whether or not the manipulation of public vs. private self-awareness (see procedure) was effective. Secondly, it was used to investigate whether individual differences in self-awareness would interact with stereotype threat to predict motor performance in the same way that was hypothesised for the manipulation of self-awareness.

Procedure

Participants first completed the practice phase of the motor task and were then subject to the public vs. private self-awareness manipulation. Participants in the public condition were asked to remember a time when they had been thinking about the way other

people were perceiving them. In the private condition, participants were asked to simply recall any event and to think about the thoughts and feelings that they had been experiencing during that event (see Govern & Marsch, 2001, for a similar manipulation). Participants were asked to take up to 2 minutes to write about their memory in as much detail as they could remember.

Participants were then asked to complete the self-awareness measure as a manipulation check. They were then subject to the stereotype threat manipulation. Participants in the high threat condition were told that the experimenter was interested in comparing the performance of Psychology and Engineering students on the roll-up task (all of the participants were psychology students). They were told that previous research suggested that engineering students would perform better because they have stronger spatial abilities. Similar stereotype threat manipulations have been used successfully in previous studies (Croizet, Després, Gauzins, Huguet, & Leyens, 2004). Participants in the low threat condition were not presented with this information.

Following the stereotype threat manipulation, participants completed the test phase of the motor task. To minimise variation in motor task performance attributable to individual differences in ability, a “performance improvement” variable was created by subtracting participants’ score in the practice phase of the motor task from their performance in the test phase thereof. Since practice scores were obtained before any of the measures or manipulations had been administered, they can be assumed to index sources of variation in motor performance that are independent of the causal influences that experiment 13 sought to investigate. As such, subtracting these practice scores from the test scores allowed the influence of these unwanted sources of variance to be minimised.

The materials used in experiment 13 – other than those taken from the preceding experiments – are presented in Appendix L.

Results

To assess the effectiveness of the self-awareness manipulation, a one-way ANOVA was conducted using self-awareness condition (public vs. private) as an independent variable and predominant public self-awareness as a dependent variable. No significant effect was observed ($F(1,74)=.099$; $p=.75$), which indicates that the manipulation of self-awareness may not have had the intended effect.

Nevertheless, the data were further explored by testing for the hypothesised interaction. A 2x2 between subjects ANOVA was conducted using stereotype threat (high vs. low) and self-awareness (public vs. private) as independent variables and motor performance as the dependent variable. Neither of the main effects were significant (both $F_s < 1$). Consistent with hypothesis 15, the interaction was significant: $F(1,76)=4.88$; $p=.03$; $\eta_p^2=.06$ (see Table 10). Furthermore, the simple effect of self-awareness was significant in the high stereotype threat conditions, wherein public self-awareness was characterised by superior motor performance relative to private self-awareness ($F(1,76)=5.17$; $p=.03$; $\eta_p^2=.06$). Conversely, there was no effect of the self-awareness manipulation in the low stereotype threat conditions ($F(1,76)=.85$; $p=.36$; $\eta_p^2=.01$). These findings are consistent with hypothesis 15.

Table 10

Belief in AGW as a function of Stereotype Threat and Self-Awareness in experiment 13

		Stereotype Threat	
		High	Low
Self-Awareness Condition	Private	.09 (.50) a	.42 (.63) a
	Public	.55 (.69) b	.22 (.85) a

Note. Standard deviations in parentheses. Postscripts denote significant differences (clomun-wise).

It was also deemed useful to test the hypothesised interaction using the measure, as opposed to the manipulation, of self-awareness. A multiple regression was conducted, using motor performance as a dependent variable. Terms for the main effects of stereotype threat and self-awareness were entered as predictor variables into the first block, with the interaction term entered into the second block. Contrary to hypothesis 15, none of the predictors were significant (all $ps > .30$).

Discussion

In accordance with hypothesis 15, the results of experiment 13 revealed an interaction between stereotype threat (high vs. low) and self-awareness (public vs. private) in predicting performance on a motor task, although this effect was only marginally significant. As predicted, public self-awareness was associated with superior performance relative to private self-awareness, but only under high, and not low, stereotype threat. However, these results were not replicated when using the measure – rather than the manipulation – of self-awareness. Moreover, no effect of the self-awareness manipulation was observed on the measure thereof. This casts doubt on the construct validity of the manipulation that was employed, although it is also possible that the measure of self-awareness lacked construct validity. However, since this measure has previously been found to have high construct validity (Governs & Marsch, 2001) whereas the manipulation of self-awareness used in experiment 13 has not, the low validity of the manipulation may be a more plausible explanation for the null results observed.

Nevertheless, it should be noted that only one study (Governs & Marsch, 2001) has examined the psychometric properties of the measure of self-awareness used in experiment 13. This study's sample was fairly homogenous (participants all attended a University in New Jersey) and may have had characteristics that limit the extent to which Govern and Marsch's (2001) findings can be generalised to the population from which experiment 13's sample was taken. Thus, although Governs and Marsch's (2001) data indicate that the

measure of self-awareness used in experiment 13 has good construct validity, this validity may not have been present when the measure was used with the participants of experiment 13. Moreover, when Gervais and Marsch (2001) tested the measure of self-awareness, they included several items addressing an additional construct (“surroundings focus”) alongside the items assessing public and private self-awareness. An individual item on a scale can affect how other items are interpreted (Schwarz et al., 1998), meaning that the psychometric properties of the public and private self-awareness scales may not have held constant when, in experiment 13, the items assessing “surroundings focus” were omitted. As such, it is possible that the failure to observe any interaction between the measure of predominant public self-awareness and stereotype threat in experiment 13 is attributable to the measure’s lack of construct validity. This would also explain why the manipulation of self-awareness failed to exert any effect on the measure thereof.

Indeed, the fact that the manipulation of self-awareness interacted with stereotype threat in the predicted manner provides evidence for its construct validity. It is difficult to think of a causal mechanism that could have given rise to the pattern of observed inter-condition differences other than the one hypothesised, indicating that the significant interaction was either a false positive or was indeed driven by the hypothesised causal mechanism. Thus, although the results of experiment 13 are clearly not as strong as might have been desired, they do provide some support for hypothesis 15.

Limitations

A number of limitations should be noted with regard to experiment 13. The disproportionate number of females among the participants raises questions in terms of the extent to which the results can be expected to generalise to male populations, particularly given that the mechanisms of stereotype threat sometimes differ for males and females (Chalabaev et al., 2012). Moreover, the failure of the self-awareness manipulation to affect scores on the measure thereof casts doubt on the construct validity of the manipulation, and the failure to observe an interaction between the measure of self-awareness and stereotype

threat limits the extent to which experiment 13's results can be said to support hypothesis 15.

A further limitation with experiment 13 that applies to the vast majority of studies investigating the impact of attentional focus, stereotype threat, self-monitoring or choking under pressure on motor performance is that it assessed performance on only a single task. There is evidence that motor tasks vary widely in terms of the underlying abilities influencing their performance, meaning that effects observed for specific tasks may not generalise to other tasks. For instance, some motor tasks require pristine performance of a single, rapid and highly automated action sequence (e.g. shooting at a dart board), whereas others involve complex chains of action sequences that must be adapted to account for dynamic situational changes (e.g. dribbling past a defender in a football match; Huber, Brown & Sternad, 2016). Some motor tasks require complex planning (e.g. planning the optimal position to aim the ball in a squash game) and therefore recruit working memory, whereas others have minimal working memory demands (Furley & Memmert, 2010). Some tasks are heavily dependent on the muscle activity occurring in the first few milliseconds of key movements, whereas others are not (Chalabaev, Brisswalter, Radel, Coombes, Easthope, & Clément-Guillotin, 2013). Some tasks are likely to be highly vulnerable to the detrimental impact of specific physiological responses, whereas others are not. For example, dart-shooting performance would presumably be greatly impaired by anxiety-induced hand trembling, whereas it is unlikely that this would also be true for running performance.

These inter-task differences are important because they indicate that stereotype threat's effects would be likely to differ for different types of task. Indeed, there is evidence indicating that the effects of stereotype threat on performance are moderated by response automaticity (Huber et al., 2016), working memory (Schmader et al., 2008), and early muscle activity in the course of action generation (Chalabaev et al., 2016). As such, motor tasks that vary in terms of the involvement of these processes may be differentially affected by stereotype threat. Therefore, it is appropriate to consider the impact of stereotype threat -

and of statistical interactions in which it is involved – across a wide range of motor tasks, rather than for a single task as was the case in experiment 13. Thus, it would be useful for future research to determine whether the findings of experiment 13 can generalise to different motor tasks.

Chapter Five: General Discussion

The experiments presented herein tested a wide range of hypotheses relating to statistical interactions involving stereotype threat. Chapter 2 investigated the moderation by motivational state and regulatory focus of the effects of stereotype threat and stereotype lift on task performance. As predicted, experiment 1 found that different point systems could be used to induce challenge, threat, promotion, or prevention foci. Following from this finding, experiment 2 found that, as hypothesised, stereotype lift was associated with superior performance relative to stereotype threat when a promotion focus or threat was induced (the trend did not reach significance in the latter case), and that stereotype threat was associated with superior performance relative to stereotype lift when a prevention focus or challenge was induced. Experiment 3 replicated the finding that stereotype lift was associated with superior performance relative to stereotype threat in the context of a promotion focus-inducing point system, and experiment 4 largely confirmed the findings of experiment 2 using a different manipulation of regulatory focus and motivational state. Thus, overall, the experiments of chapter 2 provided fairly strong evidence for the proposed interactions between stereotype threat and regulatory focus, and between stereotype threat and motivational state. Although some of the hypothesised simple effects in experiments 2 and 4 did not reach significance, the results were broadly in line with predictions.

Chapter 3 focused on an outcome variable that has hitherto never been examined empirically in studies of stereotype threat, namely belief in Anthropogenic Global Warming. Experiment 5 confirmed the assumption - which was central to the subsequent studies in chapter 3 - that people generally perceive (non-)belief in AGW to be indicative of scientific (in)competence. Guided by cognitive dissonance theory (Festinger & Carlsmith, 1959), the remaining experiments in chapter 3 tested a range of hypotheses concerning interactions between stereotype threat and a number of other variables in determining belief in AGW. The results of experiments 6 and 7 indicated that high (vs. low) stereotype threat caused increased belief in AGW, but only for individuals who were induced to adopt an entity (as

opposed to increment) theory regarding the nature of scientific ability. Experiment 8 found that the impact of high (vs. low) stereotype threat on belief in AGW varied as a function of the type of message to which religious Christian participants were exposed: those who were exposed to a message describing agreement between Church leaders and scientists about the importance of tackling climate change displayed increased belief in AGW under high (vs. low) stereotype threat, whereas this was not the case for those exposed to messages describing agreement among scientists alone or Church leaders alone about the need to tackle climate change. However, no stereotype threat*message content interaction was observed when using a behavioural measure (donations towards a climate change activist website) as the dependent variable. Similarly, experiment 9 failed to confirm the hypothesised interaction between message framing and stereotype threat: the effects of stereotype threat on belief in AGW did not vary depending on whether a message about AGW was positively or negatively framed. Similarly, experiment 10 failed to confirm the hypothesised interaction between stereotype threat and temperature in predicting belief in AGW. Across all of the experiments of Chapter 3, the results were broadly consistent with the prediction of a main effect wherein high stereotype threat is associated with increased belief in AGW relative to low stereotype threat – this trend was present in all experiments and significant or marginally significant in the majority of them.

Chapter 4 then explored interactions involving stereotype threat (other as source vs. self-as-source) and public and private self-consciousness or self-awareness. Although experiment 11 found marginally significant evidence for an interaction between public self-consciousness and type of stereotype threat in predicting motivational state, the observed trends were not in the predicted directions and do not lend themselves to a straightforward theoretical explanation. Moreover, experiment 12 failed to find a significant interaction between type of stereotype threat and public or private self-consciousness in predicting reported self-handicapping. However, experiment 13 did find evidence for the hypothesised interaction between stereotype threat and type of self-awareness (public vs. private) in

predicting performance on a motor task, although the results failed to confirm the proposed mechanism underlying this interaction.

Thus, the body of data presented within this thesis provides varying degrees of support for the different hypotheses that were proposed. However, even in instances where the hypotheses were not confirmed, the results still reflect on important theoretical issues that warrant further exploration; these are discussed in the following section.

Theoretical Implications

A number of broad theoretical implications emerge from the findings presented in this thesis. Contrary to the view that stereotype threat invariably produces undesirable consequences (e.g. Appel & Kranberger, 2012; Steele, 1997), some of the experiments reported herein indicated that, in some instances, stereotype threat can produce desirable consequences. In experiments 2 and 4, exposure to negative (vs. positive) stereotypes was associated with superior performance when prevention foci or challenge were induced. Moreover, the experiments of chapter 3 indicate that stereotype threat can have the beneficial effect of increasing belief in AGW, and the results of experiment 13 suggest that motor task performance is improved when high stereotype threat is coupled with public self-awareness. Thus, a key contribution of the current thesis is the demonstration that, in many instances, stereotype threat can in fact have desirable effects. This is consistent with a small but growing portion of the stereotype threat literature showing that the typical detrimental effects of stereotype threat on a range of outcome variables can sometimes be reversed (Grimm et al., 2009; Keller & Bless, 2008; Nguyen & Ryan, 2008; O'Brien & Crandall, 2003). By this, I do not mean to belittle the important negative consequences which stereotype threat can have for stigmatised and disadvantaged groups, such as non-whites or women. I would, however, want to argue for the need to remain open-minded about the fact that stereotype threat can have a multitude of effects, and that in addition to the well-documented detrimental effects psychologists should also focus on potential positive effects in other contexts.

Crucially, these potential benefits of stereotype threat only appear to be manifest when certain moderating variables (regulatory focus; motivational state; implicit theories; self-awareness) are set at the appropriate levels. Likewise, the results of the experiments in chapter 2 indicate that positive stereotypes may sometimes have negative consequences, which is consistent with a number of previous studies showing detrimental effects of positive stereotypes in certain circumstances (Cheryan & Bodenhausen, 2000; Grimm et al., 2009; Keller & Bless, 2008). Thus, the interactions involving stereotype threat and stereotype lift highlighted by the current work have practical utility with respect to attempts to harness the potential positive effects of these two phenomena. They also challenge more simplistic notions of stereotype threat and stereotype lift that assume that these phenomena only ever have negative or positive effects, respectively.

The current findings also have more specific theoretical implications that apply primarily to the domains that they sought to investigate. For instance, the experiments of chapter 2 explain the apparent contradiction between the results of Keller (2007; Keller & Bless, 2008) and Grimm et al. (2009, 2015). These two research teams made opposing conclusions about the interaction between regulatory focus and exposure to positive vs. negative stereotypes. Grimm et al.'s (2009) data led them to conclude that negative stereotypes enhance performance when coupled with a prevention focus (rather than promotion focus) induction, whereas positive stereotypes enhance performance when paired with a promotion focus (rather than prevention focus) induction. Keller and Bless (2008) reached exactly the opposite conclusion based on their own data. Chapter 2 provides a resolution to this apparent contradiction: when Keller and Bless (2008) intended to induce promotion vs. prevention foci, the nature of their experimental manipulation was such that they actually induced challenge vs. threat. Given the aforementioned difference between the way in which stereotype threat and lift interact with regulatory focus and motivational state, this explains both Keller and Bless' (2008) and Grimm et al.'s (2009) results.

The findings also shed light on the relationship between regulatory focus and motivational orientation (approach vs. avoidance). Approach and avoidance motivation refer to motivational states wherein an individual is focused on the prospect of reaching a desirable end-state (approach) or an undesired end-state (avoidance; Eder, Elliot & Harmon-Jones, 2013). This approach-avoidance distinction is often confused with the promotion-prevention distinction, which involves focusing on losses or gains, respectively (Scholer & Higgins, 2008). Theoretically, however, the approach-avoidance distinction is orthogonal to the promotion-prevention distinction (Scholer & Higgins, 2013). Specifically, it is possible to focus on a desirable or an undesirable end-state regardless of whether one is aiming to minimise losses or maximise gains. To use a concrete example, let us say that John wishes to gain a large amount of money – since John is seeking to actualise a gain, he will have a promotion focus (Förster et al., 1998; Förster et al., 2001). If he is thinking about the prospect of successfully obtaining the desired money (i.e. if the representation of this successful future outcome is highly accessible to him), then he will be approach-motivated because he will be focused on a desired end-state. However, he might be thinking about the prospect of failing to actualise the desired money, in which case he will be avoidance motivated because he will be focused on an undesirable end-state. Thus, the fact that John is seeking to actualise a gain (and is therefore promotion focused) does not constrain his approach/avoidance status (Malaviya & Brendl, 2014). Likewise, if John was seeking to avert a monetary loss (and was thus prevention-focused), it would be possible for him to be either approach-motivated (if he was thinking about the prospect of successfully averting the loss) or avoidance-motivated (if he was thinking about the prospect of failing to avert the loss). Hence, in theory, the promotion-prevention distinction is orthogonal to the approach-avoidance distinction.

However, in spite of this theoretical orthogonality, it is not uncommon to find cases in which researchers conflate promotion-prevention with approach-avoidance (Scholer & Higgins, 2008). For instance, experimental manipulations that are known to induce

promotion vs. prevention foci are sometimes described as manipulations of approach vs. avoidance motivation, and vice-versa (eg. Chalabaev et al., 2015; Roskes, Elliot, Nijstad & Dreu, 2013). Given that challenge and threat states are characterised by approach and avoidance motivation, respectively (Blascovich & Mendes, 2010), the results of chapter 2 support the theoretical distinction between the approach-avoidance and promotion-prevention dimensions. Specifically, the results of chapter 2 indicated that regulatory focus (promotion vs. prevention) modulates the effects of positive and negative stereotypes in a way that is different to the modulation by motivational state (approach vs. avoidance). This is consistent with existing research showing that manipulations of regulatory focus have different effects on a range of outcome variables than do manipulations of motivational state (Sassenberg et al., 2015).

Moreover, the experiments of chapter 2 inform our understanding of the relationship between stereotype threat and stereotype lift. As noted in the introduction, these phenomena may be qualitatively distinct (i.e. their effects may be mediated by different variables) or only quantitatively distinct (i.e. their effects may arise because they have opposite impacts on the same mediating variable). For example, it could be that stereotype threat impairs task performance by increasing task-related anxiety (Schmader et al., 2008), whilst stereotype lift enhances performance by reducing task-related anxiety. This would be a quantitative difference, because it would involve the stereotype threat and stereotype lift having an opposing effect on the same mediating variable. Alternatively, it could be that stereotype threat impairs performance by increasing anxiety, whilst stereotype lift enhances performance by increasing the accessibility of useful task-relevant information (Wheeler & Petty, 2001). This would be a qualitative difference because it would mean that the effects of stereotype threat and stereotype lift are mediated by independent mechanisms.

The results of chapter 2 support the former alternative, because they indicate that the effects of both stereotype threat and stereotype lift are at least partly attributable to the extent to which they induce regulatory fit or mismatch. This means that stereotype threat and

stereotype lift are quantitatively different (but not qualitatively different) phenomena, because their effects are mediated by similar mechanisms.

Likewise, the experiments of chapter 3 also have important theoretical implications. The finding that high (vs. low) science-related stereotype threat tends to trigger increased belief in AGW is consistent with the view that stereotype threat can be characterised as a form of cognitive dissonance (Schmader et al., 2008). Awareness of a stereotype that implies low ingroup scientific ability is inconsistent with people's desire to appear scientifically competent and thus generates cognitive dissonance. This dissonance can be eliminated by affirming one's own scientific ability (Jamieson & Harkins, 2007), and one way to do this is to express increased belief in AGW. Thus, the experiments of chapter 3 support the view (Schmader et al., 2008) that stereotype threat is a form of cognitive dissonance.

Fewer theoretical inferences can be made on the basis of the experiments of chapter 4 due to the dearth of significant trends identified therein. The absence of significant findings in experiments 11 and 12 may be attributable to the manipulation of self-as-source vs. other-as-source stereotype threat that was employed in these experiments. Although the source dimension of stereotype threat has been subject to theoretical speculation (Shapiro & Neuberg, 2007) and measurement (Shapiro, 2011), no experiments have hitherto attempted to manipulate it. As such, the manipulation used in experiments 11 and 12 was newly improvised and may have failed to accomplish its intended effect. Alternatively, the proposed "source" dimension of stereotype threat may be of minimal theoretical utility. This highlights the importance of further research to establish construct-valid manipulations of self-as-source vs. other-as-source stereotype threat.

More broadly, the current findings have implications for the understanding of the relationship between stereotype threat and choking under pressure. Previous research has shown that the effects of choking under pressure on performance are moderated by regulatory focus (Worthy et al., 2009), motivational state (McKay et al., 2012), implicit theories of ability (Molden & Dweck, 2006) and public self-awareness (Beilock & Carr,

2001). The current work found these same variables to moderate the effects of stereotype threat on performance, highlighting the overlap between stereotype threat and choking under pressure.

Limitations

It is important to note a number of limitations that apply to the experiments presented within this thesis. Most of these were online experiments and thus carry all of the associated drawbacks (Chandler, Mueller, & Paolacci, 2014). For instance, there is evidence indicating that online participants are more likely to be distracted by experiment-irrelevant environmental stimuli such as mobile phones (Clifford & Jerit, 2014), and that they may take less care to ensure that they have understood task instructions (Crump, McDonnell & Guericks, 2013). These factors can potentially corrupt data collected in online studies, which would question the validity of the results presented herein.

Moreover, it is reasonable to suspect that stereotype threat and stereotype lift may be experienced differently depending on whether or not they are induced in online contexts. For example, the fear that one's own behaviour will be interpreted by others as stereotype-consistent is an important component of stereotype threat (Brown & Pinel, 2003). This fear would be expected to be greater when performing a task in the immediate vicinity of other people who may hold the stereotype, and may diminish markedly for individuals participating alone in the comfort of their own homes. Indeed, evidence indicates that the impact and nature of stereotype threat can vary as a function of the extent to which fear of confirming the stereotype is reinforced by the behaviour and characteristics of the people present during task performance (Inzlicht & Ben-Zeev, 2003; Pennington & Heim, 2016; Stone & McWhinnie, 2008).

As noted previously, this is particularly relevant to experiments 11 and 12, which attempted to manipulate self-as-source stereotype threat vs. other-as-source stereotype threat. Clearly, a central aspect of other-as-source stereotype threat is the sense that one's performance will be used by others to inform the perceived truth value of the negative

stereotype in question (Shapiro & Neuberg, 2007). The fact that online participation is likely to reduce concerns relating to the way in which one's performance will be perceived by those who have access to it (Maglio, Trope & Liberman, 2013) therefore raises doubts with respect to the feasibility of inducing other-as-source stereotype threat in the context of an online experiment. Indeed, the null results of experiments 11 and 12 suggest that in-person participation may be of particular importance for studies examining differences between self-as-source and other-as-source stereotype threat.

Nevertheless, it should also be noted that some studies have found online samples to be more attentive to task instructions than traditionally recruited participants (Hauser & Schwarz, 2016). Moreover, where cross-referencing is possible, the online data from the current thesis is consistent with data collected in person. Specifically, experiment 3 was consistent with experiments 2 and 4 in indicating that performance is enhanced when a promotion focus is coupled with a positive (vs. negative) stereotype. Thus, although it would be useful to attempt to replicate the findings of the current thesis using in-person samples, the online data presented herein is still informative with respect to the hypotheses being tested.

An additional limitation that applies to the experiments herein relates to the number of stereotype threat conditions that were used in each experiment. In chapter 2, participants were exposed to either positive or negative ingroup stereotypes – there was no control condition involving exposure to no stereotype at all. This means that the observed differences between the stereotype valence conditions could be attributable to the impact of ingroup stereotypes relative to no stereotypes, the impact of negative ingroup stereotypes relative to no stereotypes, or both. The same limitation applies to a number of previous studies of interactions between stereotype valence, regulatory focus, and motivational state (Alter et al., 2010; Grimm et al., 2009; Keller & Bless, 2008). In chapter 3, although the inclusion of a stereotype threat condition and a control condition permitted causal inferences about the effect of stereotype threat on the dependent variables of interest, it may have been

informative to include conditions in which participants were exposed to positive ingroup science-related stereotypes.

Indeed, if a stereotype threat-induced desire to display scientific ability encouraged people to express belief in AGW (as argued in chapter 3), then it may also be the case that a positive science-related stereotype would cause people to feel self-assured with respect to their own scientific ability and, consequently, less prone to use belief in AGW as a means of displaying this ability. Just as reminders of one's own positive moral credentials (as reflected by past acts of kindness) liberate people to behave immorally (moral self-licensing; Merritt, Effron & Monin, 2010), it is possible that reminders of one's group's (and, by extension, one's own) scientific credentials liberate people to express unscientific views such as denial of AGW. It would have been useful to include positive stereotype conditions in chapter 3 to test this possibility, although it would also be helpful for future research could also address this point.

In particular, it would be useful to address the potential moderation of the effects of stereotype lift by implicit theories of ability. Prior research (Mendoza-Denton et al., 2008; Froehlich et al., 2016) indicates that holding an increment theory of the stereotyped ability can eliminate the typical beneficial effect of stereotype lift. This challenges the common assumption that it is always preferable to hold an increment theory rather than an entity theory (Molden & Dweck, 2006) and raises questions about the appropriateness of using implicit theory manipulations as interventions to eliminate the detrimental impact stereotype threat. For example, some researchers have promoted the use of school-wide interventions designed to induce increment beliefs as a means of reducing the impact of stereotype threat on students from negatively stereotyped groups (Aronson et al., 2002) However, if the same intervention would be expected to impair the performance of students from positively stereotyped groups (Mendoza-Denton et al., 2008; Froehlich et al., 2016), then its appropriateness would be questionable, because the ethical acceptability of enhancing the scores of some students at the expense of others is open to debate.

Similarly, it would have been useful to include control conditions in experiments 11 and 12 in order to disentangle the effects of the different types of stereotype threat being induced. With a design that includes only self-as-source and other-as-source stereotype threat conditions, it is impossible to determine whether any cross-condition difference is due to the effects of self-as-source stereotype threat, other-as-source stereotype threat or both. However, given that experiments 11 and 12 failed to yield meaningful significant findings, this point is purely academic as far as these experiments are concerned. Conversely, the lack of a control condition in experiment 13 does affect the interpretation of the results obtain therein. Specifically, the self-awareness manipulation involved an induction of either public or private self-awareness, but there was no control condition in which neither type of self-awareness was induced. As such, the self-awareness manipulation of experiment 13 cannot provide unambiguous evidence for the impact of public or private self-awareness in isolation, because differences between the two conditions could be attributable to the effect of public self-awareness alone, private self-awareness alone, or both. Nevertheless, experiment 13 does allow inferences to be made regarding the impact of high public self-awareness *relative to* high private self-awareness, which is useful in the context of the current thesis because it reflects on the veracity of the stated hypothesis.

Concluding Comment

The current work has shed light on a number of statistical interactions involving stereotype threat and stereotype lift. The results of chapter 2 indicate that the effects of stereotype threat and stereotype lift are moderated by regulatory focus and motivational state. The results of chapter 3 indicate that science-related stereotype threat can influence belief in anthropogenic global warming, and that this effect is moderated by implicit theories of scientific ability and the content of messages relating to AGW. The results of chapter 4 suggest that stereotype threat can modulate the effects of self-awareness on motor task performance, and that online participation platforms may not be appropriate for studies attempting to manipulate self-as-source vs. other-as-source stereotype threat. Taken together, the results highlight the overlap between stereotype threat and choking under pressure, the nature of the difference between stereotype threat and stereotype lift, and the importance of understanding moderating relationships when attempting to use stereotype threat research to enhance performance in real-world settings.

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Appendices

Throughout the appendices, any text that was not part of the described materials is underlined. Any non-underlined text presented below would have been part of the materials themselves.

Appendix A: Materials for Experiment 1

Point System Manipulation

Challenge Condition

In this experiment, you will complete a test of reasoning ability.
In total, there will be 10 questions on the test.
For each question that you get right, you will gain 1 point.
If you get a question wrong or if you do not submit an answer, you will gain 0 points.

Threat Condition

In this experiment, you will complete a test of reasoning ability.
In total, there will be 10 questions on the test.
For each question that you get right, you will gain 1 point.
If you get a question wrong or if you do not submit an answer, you will lose 1 point.

Promotion Condition

In this experiment, you will complete a test of reasoning ability.
In total, there will be 10 questions on the test.
At the beginning of the test, you will start with 0 points.
For each question that you get right, you will gain 1 point.
If you get a question wrong or if you do not submit an answer, you will gain 0 points.
You should aim to gain at least 6 points out of 10 by the end of the test.

Prevention Condition

In this experiment, you will complete a test of reasoning ability.
In total, there will be 10 questions on the test.
At the beginning of the test, you will start with 10 points.
If you get a question wrong or if you do not submit an answer, you will lose 1 point.
For each question that you get right, you will gain 0 points.
You should aim to lose no more than 4 points out of 10 by the end of the test.

Motivational Orientation Measure

On a scale of 1 to 7, Do you see the test as a threat or as a / challenge? / 1 is 'I see it as a threat'; 7 is 'I see it as a challenge'.

1

2

3

4

5

6

7

Appendix B: Materials for Experiment 2

Point System Manipulation

Challenge Condition

In this experiment, you will complete a test of reasoning ability.
In total, there will be 20 questions on the test.
For each question that you get right, you will gain 1 point.
If you get a question wrong or if you do not submit an answer, you will gain 0 points.

Threat Condition

In this experiment, you will complete a test of reasoning ability.
In total, there will be 20 questions on the test.
For each question that you get right, you will gain 1 point.
If you get a question wrong or if you do not submit an answer, you will lose 1 point.

Promotion Condition

In this experiment, you will complete a test of reasoning ability.
In total, there will be 20 questions on the test.
At the beginning of the test, you will start with 0 points.
For each question that you get right, you will gain 1 point.
If you get a question wrong or if you do not submit an answer, you will gain 0 points.
You should aim to gain at least 14 points out of 20 by the end of the test.

Prevention Condition

In this experiment, you will complete a test of reasoning ability.
In total, there will be 20 questions on the test.
At the beginning of the test, you will start with 20 points.
If you get a question wrong or if you do not submit an answer, you will lose 1 point.
For each question that you get right, you will gain 0 points.
You should aim to lose no more than 6 points out of 20 by the end of the test.

Stereotype Valence Manipulation (employed in experiments 2, 3 and 4).

The content below shows the text that was presented to female participants in each stereotype valence condition. The manipulation was applied in the reverse manner

for male participants – in other words, males in the stereotype threat condition saw the same text as females in the stereotype lift condition, whilst males in the stereotype lift condition saw the same text as females in the stereotype threat condition.

Stereotype Threat Condition

Previous research has established that different types of people vary in terms of how well they tend to perform on this test - for example, men tend to perform better than women.

Stereotype Lift Condition

Previous research has established that different types of people vary in terms of how well they tend to perform on this test - for example, women tend to perform better than men.

Scientific Reasoning Questions used in Experiments 2, 3 and 4

Question 1

Determine what should replace the question mark in the following series:

1 2 4 8 16 32 ?

5

7

16

22

44

64

79

85

Question 2

Seven hours ago it was five hours before the time when there would be $\frac{2}{3}$ of the day still remaining. What time is it now? Assume that the day starts at 12:00 A.M.

9:30 AM

10:00 AM

10:30 AM

11:00 AM

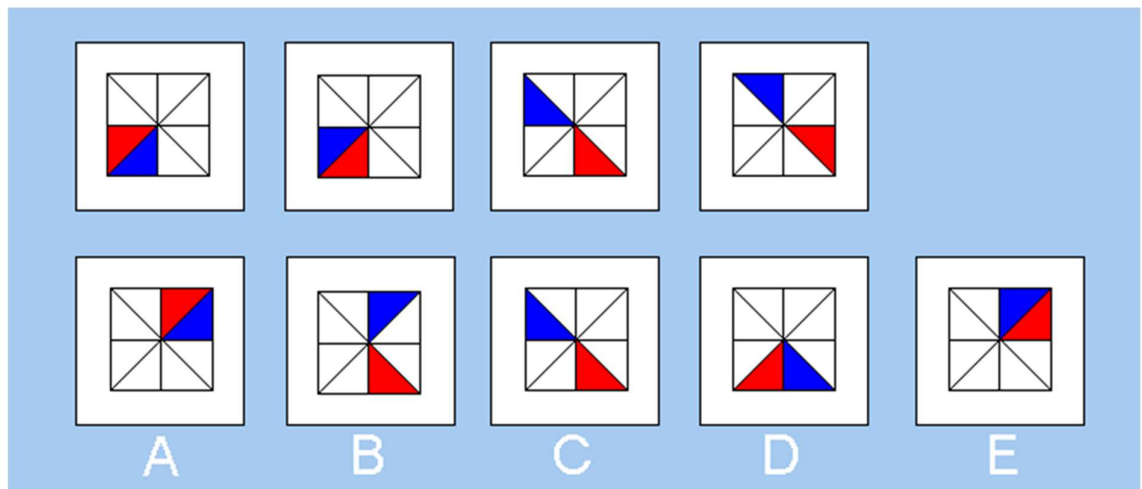
11:30 AM

12:00 PM

12:30 PM

1:00 PM

Question 3



In the image above, the four pictures on the top row follow a pattern. Which picture on the bottom row should complete this pattern?

Is it A, B, C, D or E?

Question 4

There were 100 people present at a baseball card show:

59 wore glasses. 72 were baseball card collectors

What is the lowest possible number of people at the show who wore glasses AND collected baseball cards?

31

32

33

34

35

36

37

38

Question 5

The words in the first column are written in a secret code in the second column. However, the secret writings in the second column are not in the same order. What is the code assigned for the letter D?

BRAIN 13529

DRAIN 35293

RIVER 13754

DRIVE 83754

1

2

3

4

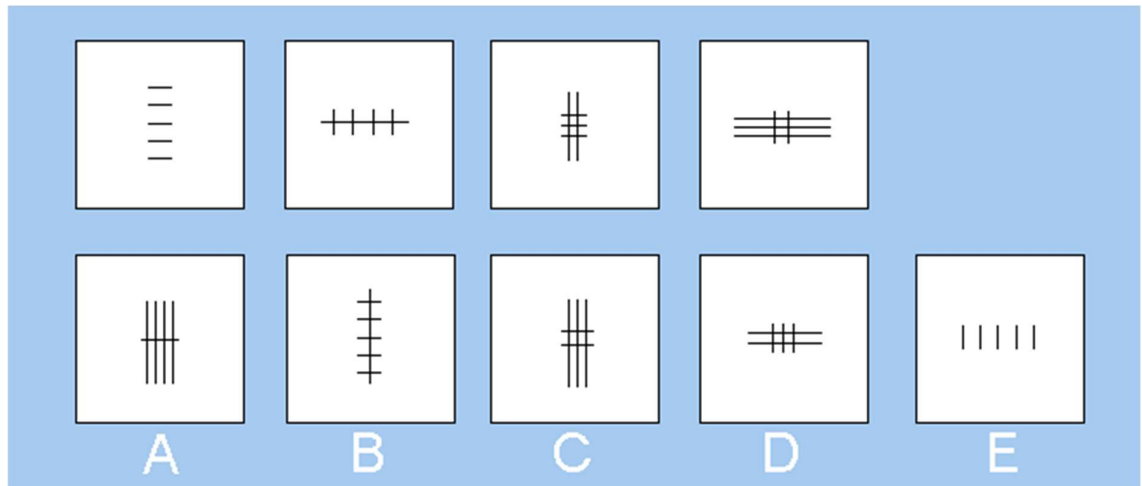
5

6

7

8

Question 6

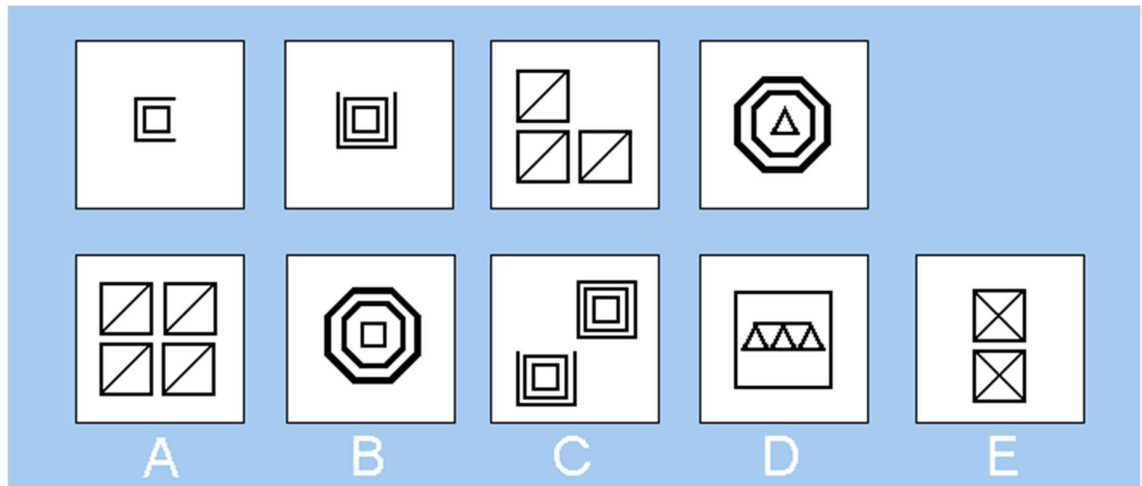


In the image above, the four pictures on the top row follow a pattern. Which picture on the bottom row should complete this pattern?

Is it A, B, C, D or E?

- A
- B
- C
- D
- E

Question 7



In the image above, the four pictures on the top row follow a pattern. Which picture on the bottom row should complete this pattern?

Is it A, B, C, D or E?

A

B

C

D

E

Question 8

What letter should replace the question mark in the following series:

C I D J F L I O ?

K

L

M

N

O

Question 9

Identify the number below where the sum of the last two digits is $\frac{1}{2}$ of the first digit, the second digit is $\frac{1}{2}$ of the first digit, the fourth digit is $\frac{1}{2}$ of the third digit and the fifth digit is half of the fourth digit:

12346

63142

63412

46321

64321

63421

63241

Question 10

Below is a series that follows a certain logic:

0 2 6 12 20 30...

What would be the 50th number in this series? (Assume that 0 is the 1st number in the series).

2000

2150

2300

2450

2550

2750

2900

Question 11

X is not greater than Y

Y is greater than Z

A is greater than Y

A is less than B

B is equal to $X+2$

C is greater than Y

Which of the following **MUST** be true?

C is equal to A

B is equal to $A+X$

C is greater than A

X is equal to Y

Z is not greater than A

Question 12

What number comes next in this sequence:

11 13 17 19 23 29 31

32

33

34

35

36

37

38

39

40

Question 13

John is Jane's father.

Jess is John's mother.

Tim is Jess' brother.

Tara is Tim's daughter.

Toby is Tara's son.

What is the relationship between Jane and Toby?

First Cousins

Third Cousins

Father and Daughter

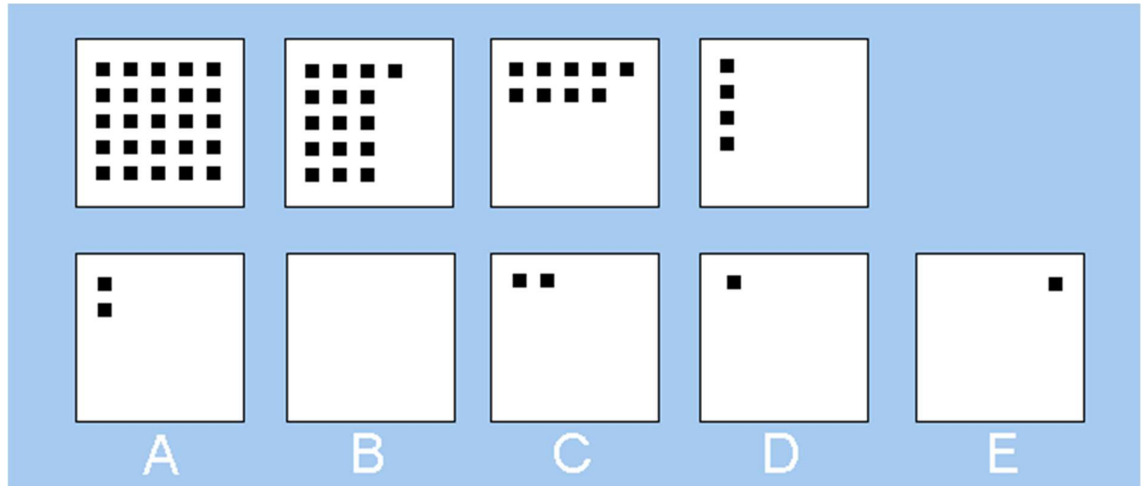
Cousins once removed

Second Cousins

There is no biological relationship

Aunt and Uncle

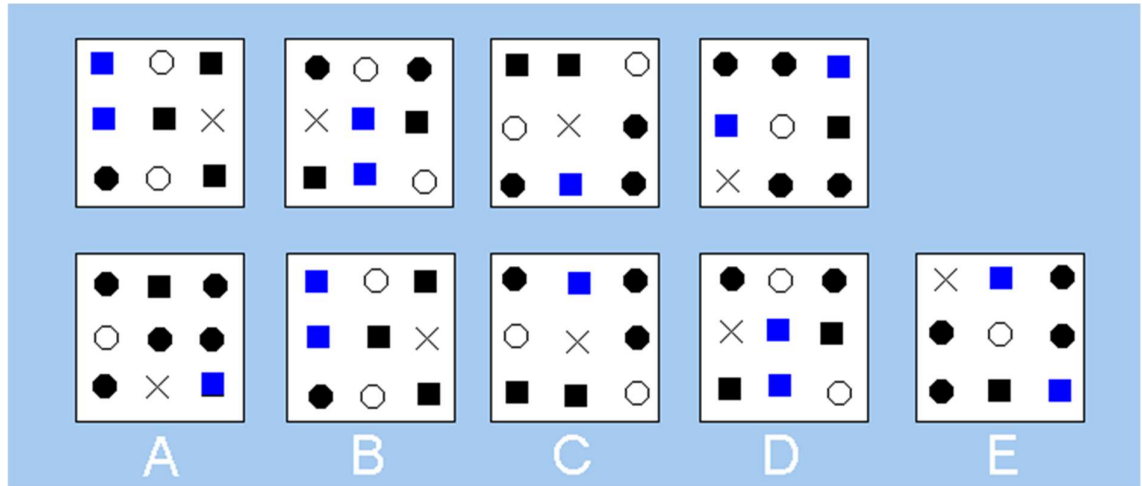
Question 14



In the image above, the four pictures on the top row follow a pattern. Which picture on the bottom row should complete this pattern?

Is it A, B, C, D or E?

- A
- B
- C
- D
- E



In the image above, the four pictures on the top row follow a pattern. Which picture on the bottom row should complete this pattern?

Is it A, B, C, D or E?

- A
- B
- C
- D
- E

Question 16

What number comes next in the sequence below?

2 5 10 17 26 37 50 ?

- 60
- 61
- 62
- 63
- 64
- 65
- 66
- 67

Question 17

X is not less than or equal to a number that is one less than $Y+1$.

Y is 2 greater than Z, which is not less than $A+2$.

Z is not more than $A+2$.

Which of the following statements is definitely true?

A is greater than itself

Z is greater than Y

X is greater than $A+Y$

X is greater than $A+5$

Y is greater than $A+5$

Y is greater than $A+4$

X is greater than $A+4$

X is less than $A+6$

$A=0$

Question 18

$$X+Y=12$$

$$2X+3Y=31$$

What is the value of X?

5

6

7

8

9

10

11

Question 19

At a classic car auction, thirty buyers were present. Ten of the buyers bought fewer than 6 cars. Eight of the buyers bought more than 7 cars. Five buyers bought more than 8 cars. One

buyer bought more than 9 cars. What is the total number of buyers who bought 6, 7, 8, or 9 cars?

13

14

15

16

17

18

19

20

Question 20

What number comes next in this sequence?

1 1 2 3 5 8 13 ?

17

18

19

20

21

22

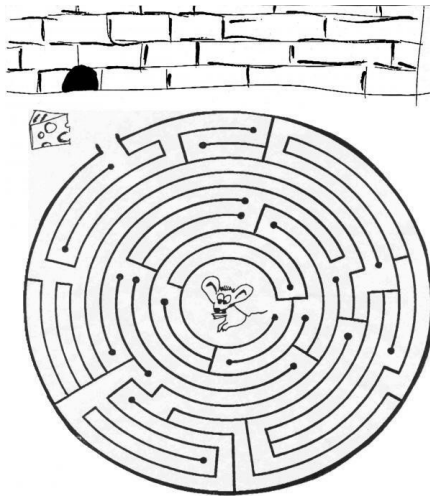
23

24

Appendix C: Materials for Experiment 4

Mouse in the Maze Manipulation

Challenge/Promotion Condition



Michael the mouse was in the middle of a maze when suddenly he smelt a piece of cheese lying outside its entrance. He knew that if he did not get to the cheese soon, then somebody else would eat it before he had even taken a single bite. However, he also knew that if he could find his way out of the maze quickly, then he would be able to eat all of it before anybody else could get their hands on it. He began hastily making his way out, thinking longingly of how tasty and pleasurable it would feel to eat the huge chunk of delicious cheese all by himself.

Challenge/Prevention Condition



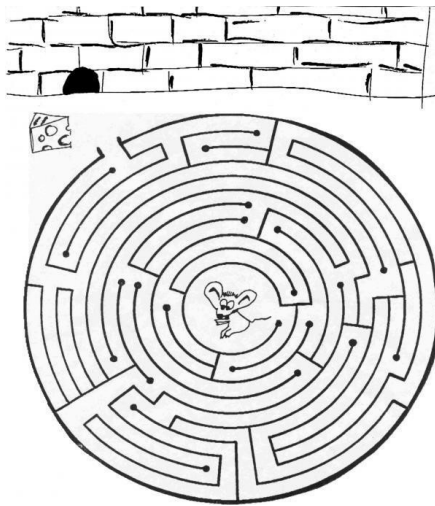
Michael the mouse was in the middle of a maze when suddenly he noticed Oscar the owl flying high above him. Michael knew that if he let Oscar catch him, he would certainly be eaten in one gulp. However, Michael also knew that if he managed to get out of the maze and into his mouse hole in the wall, then there would be no way for Oscar to eat him. He began hastily making his way out, thinking longingly of the safety and security of his mouse hole and of how much of a relief it would be to arrive there before Oscar managed to catch him.

Threat/Promotion Condition



Michael the mouse was in the middle of a maze when suddenly he noticed Oscar the owl flying high above him. Michael knew that if he let Oscar catch him, he would most certainly be eaten in one gulp. However, Michael also knew that if he managed to get out of the maze and into his mouse hole in the wall, then there would be no way for Oscar to eat him. He began hastily making his way out, thinking in intense fear of how horrible it would feel to spend his last moments in the mouth of a hungry owl.

Threat/Prevention Condition



Michael the mouse was in the middle of a maze when suddenly he smelt a piece of cheese lying outside its entrance. He knew that if he did not get to the cheese soon, then somebody else would eat it before he had even taken a single bite. However, he also knew that if he could find his way out of the maze quickly, then he would be able to eat all of it before anybody else could get their hands on it. He began hastily making his way out, thinking desperately about how hungry he felt – if he did not reach the cheese before somebody else did, then it would be a long time before his next meal.

Appendix D: Materials for Experiment 5

Manipulation of target belief in AGW

“Target Believes in AGW” condition

Please read the following description of John, and then answer the questions below.

John is 35 years old.
John has black hair.
John likes to walk in his local park.
John is married.
John has a pet dog.
John believes in man-made global warming.

“Target does not Believe in AGW” condition

Please read the following description of John, and then answer the questions below.

John is 35 years old.
John has black hair.
John likes to walk in his local park.
John is married.
John has a pet dog.
John does not believe in man-made global warming.

Description of Chloe

Please read the following description of Chloe, and then answer the questions below.

Chloe's favorite colour is blue.
Chloe likes swimming.
Chloe has known her best friend for 11 years.
Chloe attends an Origami class.
Chloe has brown hair.
Chloe is 48 years old.

Questions about John and Chloe

These questions were asked once in reference to John and then again in reference to Chloe.

On a scale of 1 to 7, how kind do you think John is? 7 is "extremely kind" and 1 is "extremely unkind".

1

2

3

4

5

6

7

On a scale of 1 to 7, how funny do you think John is? 7 is "extremely funny" and 1 is "not funny at all".

1

2

3

4

5

6

7

On a scale of 1 to 7, how good do you think John is at thinking scientifically? 7 is "extremely good at thinking scientifically" and 1 is "not at all good at thinking scientifically".

1

2

3

4

5

6

7

Scientific Competence Question

People who do not believe in man-made global warming are worse at thinking scientifically relative to people who do believe in man-made global warming. Do you agree?

Strongly agree

Agree

Somewhat agree

Neither agree nor disagree

Somewhat disagree

Disagree

Strongly disagree

Appendix E: Materials for Experiment 6

Stereotype Threat Manipulation

High Stereotype Threat Condition

Thank you. In this experiment, you will complete a test of Scientific ability. We are assessing the test performance of people who live in and outside of America. Our past research indicates that people who live in America have superior scientific ability to people who live outside America.

Low Stereotype Threat Condition

Thank you. In this experiment, you will complete a test of Scientific ability. Past research indicates that performance on this test is not related to the nationality of the test-taker.

Belief in AGW Measure for experiments 6, 7, 8, 9 and 10

1.) How likely do you think it is that global warming is occurring now?

Very Unlikely Unlikely Somewhat Unlikely Somewhat Likely
Likely

2.) Global temperatures have been rising significantly over the past decade. Do you agree with this statement?

Strongly Disagree Disagree Neither Agree nor Disagree Agree Strongly Agree

3.) Climate change is definitely NOT occurring. Do you agree with this statement?

Strongly Disagree Disagree Neither Agree nor Disagree Agree Strongly Agree

4.) The Earth's oceans have NOT been increasing in temperature in recent decades. Do you agree with this statement?

Strongly Disagree Disagree Neither Agree nor Disagree Agree Strongly Agree

5.) Human activities such as burning fossil fuels can significantly raise the planet's temperature. Do you agree with this statement?

Strongly Disagree Disagree Neither Agree nor Disagree Agree Strongly Agree

6.) Human actions have NOT resulted in an increase in global temperatures. Do you agree with this statement?

Strongly Disagree Disagree Neither Agree nor Disagree Agree Strongly Agree

7.) Global warming CANNOT be reduced by regulating fossil fuel use. Do you agree with this statement?

Strongly Disagree Disagree Neither Agree nor Disagree Agree Strongly Agree

8.) Climate change is real and man-made. Do you agree with this statement?

Strongly Disagree Disagree Neither Agree nor Disagree Agree Strongly Agree

Implicit Theory Manipulation for Experiments 6 and 7

Increment Theory Condition

Our past research has shown that performance on this test can be substantially improved through practice. In other words, natural ability has very little influence on how well people perform, whereas effort and practice are strong predictors of performance.

Entity Theory Condition

Performance on the test is largely a matter of natural ability and is not strongly affected by effort or practice. In other words, some people are naturally gifted when it comes to reasoning scientifically and tend to perform well regardless of how much

relevant practice they have had beforehand. Others lack natural ability and are unlikely to improve even after extensive practice.

Appendix F: Materials for Experiment 7

Religiosity Measure

1.) "I attend religious services regularly."

Is the above statement true of you?

Not at all true of me Not very true of me Somewhat true of me Quite true of me
Very true of me

2.) "Spiritual values are more important than material things."

Do you agree with the above statement?

Strongly Agree Agree Neither agree nor disagree Disagree Strongly
Disagree

3.) What is the general importance of God in your life?

Not at all important Unimportant Somewhat important Important Very
important

4.) How would you characterise yourself in terms of religiosity?

Very religious Moderately religious Slightly religious Not at all religious
Anti-religious

Stereotype Threat Manipulation for Experiments 7 and 8

Italicised text only appeared in the low stereotype threat condition.

In this experiment, you will complete a test of Scientific ability.

This test has been shown to be a fair test of ability for different groups of people. For instance, people of different religious groups tend to perform equally well.

Appendix G: Materials for Experiment 8

Message Manipulation

Scientists and Christian clergy unite in urging world leaders to take drastic action to combat climate change

Prominent scientists and clergymen have issued urgent calls for world governments to take a strong stance in restricting carbon dioxide emissions as a means of combatting climate change. In July, 72 Nobel prize winning Scientists came together in the signing of the Mainau declaration, expressing their shared concern that the continued consumption of fossil fuels will "lead to wholesale human tragedy". The move follows statements made by other prestigious scientific organizations, such as the African Academy of Sciences, the American Association for the Advancement of Science, the European Science Foundation and the International Council of Academies of Engineering and Technological Sciences, all of which have implored world leaders to take a firm stance in tackling climate change. "The year 2014 ranks as Earth's warmest since 1880, according to two separate analyses by NASA and National Oceanic and Atmospheric Administration (NOAA) scientists. The 10 warmest years in the instrumental record, with the exception of 1998, have now occurred since 2000. This trend continues a long-term warming of the planet, according to an analysis of surface temperature measurements by scientists at NASA's Goddard Institute of Space Studies (GISS) in New York."

Meanwhile, Christian clergymen from across countries and denominations have added their voices to those of the Scientific community in urging prompt and comprehensive action against climate change. Bishops, Priests, Ministers and Pastors have emphasized the religious duty to protect the world's most vulnerable populations from drought, famine, flooding and natural disasters, all of which have been growing more frequent and intense in the wake of continued global warming. Speaking about the catastrophic effects of climate change, Pope Francis said that "the problems are getting worse. We are at the limits. If I may use a strong word I would say that we are at the limits of suicide." A diverse range of Christian leaders and organizations have joined the chorus of proclamations on the need to aggressively tackle climate change, including the Eastern Orthodox Church, Quakers International, the Baptist council of Europe, the United Methodist Church and the All Africa Conference of Churches. "There is a fundamental Christian imperative to help the poor, the needy and the hungry and to protect God's Earth. We are currently failing to meet that obligation. Those who have contributed the least to greenhouse gas emissions stand to suffer most from their effects. If we continue along the path of endless, glutinous consumption then the consequences will not be good" said Michael Jones, a prominent British pastor, at a recent meeting of Church leaders.

Christian clergy unite in urging action to combat climate change

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Scientists unite in urging action to combat climate change

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Donation Question

Before we began collecting responses for this survey, we set aside a sum of money that would potentially go to organizations that aim to increase public awareness about the threats posed by man-made global warming. For each person that completes this survey, we will donate up to 5 cents to 'Skeptical Science', which is a website run by climate Scientists designed to raise awareness about man-made global warming and its likely consequences. You can see this website for yourself here:

<http://www.skepticalscience.com/>

The amount that we donate for your survey completion is up to you. Use the selection below to choose the amount of money that you would like us to donate. For instance, if you choose '3', we will donate 3 cents of the 5 cents allocated for your survey completion to Skeptical Science, keeping 2 cents for ourselves. If you choose '0', we will donate 0 of the 5 cents allocated for your survey to the skeptical science blog, keeping all 5 cents for ourselves. This money will NOT be taken from the amount that you will be paid for completing this survey - you will be paid 5 cents regardless of the option that you select below.

How many cents would you like us to donate to Skeptical Science for your survey completion? This money will NOT be taken from the amount that you will be paid for completing this survey - you will be paid 5 cents regardless of the option that you select below.

- 0
- 1
- 2
- 3
- 4
- 5

Temperature Questions

Think about the temperature outside in the place where you are currently located. If you had to guess, would you say the temperature right now is hotter or colder than the typical temperature over the past month? Give your answer on a scale of 1 to 10, with 1 being 'much colder than the typical temperature over the past month' and 10 being 'much hotter than the typical temperature over the past month'.

1 2 3 4 5 6 7 8 9 10

How hot or cold do you feel right now? Give your answer on a scale of 1 to 10, with 1 being 'I feel extremely cold' and 10 being 'I feel extremely hot'.

1 2 3 4 5 6 7 8 9 10

Appendix H: Materials for Experiment 9

Stereotype Threat Manipulation

Text presented to participants above 34 years old in the high stereotype threat condition

In this experiment, you will complete a test of cognitive ability.

Our previous research has indicated that people above the age of 34 tend to perform more poorly compared to younger people.

Before the test, you will be asked to read a short article and complete a brief questionnaire addressing a number of topics.

Text presented to participants below 35 years old in the high stereotype threat condition

Thank you. In this experiment, you will complete a test of general knowledge.

We are investigating the effects of age on cognitive ability. Our previous research has indicated that people below the age of 35 tend to perform more poorly compared to older people.

Text Presented to all participants in the low stereotype threat condition

Thank you. In this experiment, you will complete a test of cognitive ability.

We are investigating the effects of age on cognitive ability. Our test has been specially designed to be fair for people of all ages, which means that younger people are just as likely as older people to perform well.

Frame Manipulation

Positive Frame

Global warming is arguably the most pressing problem facing the world today. Rising temperatures are already beginning to trigger hurricanes, floods, droughts and heatwaves with greater and greater frequency.

If we invest in green technologies, cut carbon emissions and protect the planet's greenhouse gas-consuming forests, we can save the world from catastrophic global warming. This will create a happier, healthier and harmonious environment that will sustainably support the needs of future generations.

Negative Frame

Global warming is arguably the most pressing problem facing the world today. Rising temperatures are already beginning to trigger hurricanes, floods, droughts and heatwaves with greater and greater frequency.

If we fail to cut carbon emissions, invest in green technologies and protect the planet's greenhouse gas-consuming forests, the world will be unable to avoid catastrophic global warming. This will lead to a polluted, dangerous and inhospitable environment that will not support the needs of future generations.

Appendix I: Materials for Experiment 10

Political Orientation Measure

On a scale of 1 to 9, how liberal or conservative would you say you are? "1" indicates "extremely conservative" and "9" indicates "extremely liberal"

1 2 3 4 5 6 7 8 9

Stereotype Threat Manipulation

High Stereotype Threat

In this experiment, you will complete a test of scientific ability. We are investigating differences in scientific ability between Americans and Europeans. There is currently evidence suggesting that Americans tend to have low scientific ability compared to Europeans.

Low Stereotype Threat

In this experiment, you will complete a test of scientific ability.

Temperature Manipulation

The purpose of this section is to classify the pictures below according to whether or not they contain animals.

Please look at each picture and decide whether or not it contains an animal.

1.) Is there an animal in this picture?

Yes, there is an animal.

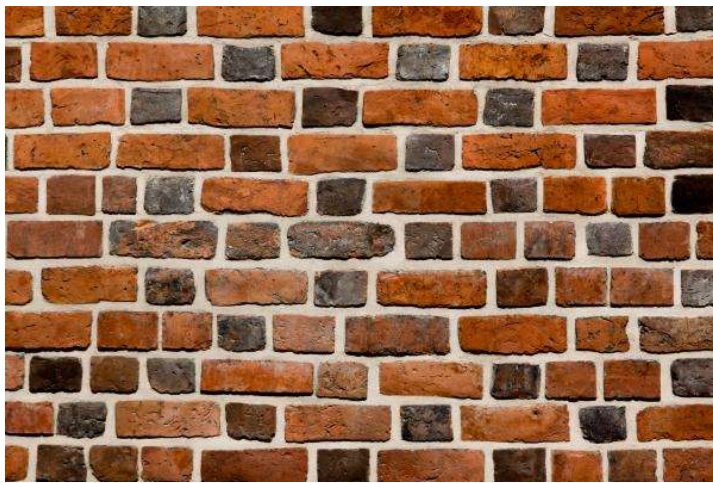
No, there is no animal.



2.) Is there an animal in this picture?

Yes, there is an animal.

No, there is no animal.



3.) Is there an animal in this picture?

Yes, there is an animal.

No, there is no animal.

Image displayed in high temperature condition



Image displayed in low temperature condition



Temperature Measure

On a scale of 1 to 9, how hot do you feel right now? "1" indicates "extremely cold" and "9" indicates "extremely hot".

1 2 3 4 5 6 7 8 9

Appendix J: Materials for Experiment 11

Stereotype Threat Manipulation (Self-as-source vs. Other-as-source) used in experiments 11 and 12

The text below was shown to female participants; male participants were shown exactly the same text, except that the words “men” and “women” were reversed.

Self-as-Source Condition

You are about to complete a test of cognitive ability. Previous research strongly suggests that women tend to have inferior cognitive abilities to men.

After you finish the test, you will be able to evaluate your own cognitive ability based on your performance to see whether it is consistent with you gender.

Other-as-source condition

You are about to complete a test of cognitive ability. Previous research strongly suggests that women tend to have inferior cognitive abilities to men.

After you finish the test, we will calculate your score in order to evaluate whether or not your cognitive abilities are consistent with this gender difference.

Measure of Public and Private Self-Consciousness for experiments 11 and 12

1.) I'm always trying to figure myself out. (Private)

Not at all true of me

Not true of me

Somewhat true of me

True of me

Very true of me

2.) I'm concerned about my style of doing things. (Public)

Not at all true of me

Not true of me

Somewhat true of me

True of me

Very true of me

3.) Generally, I'm not very aware of myself. (Private)

Not at all true of me

Not true of me

Somewhat true of me

True of me

Very true of me

4.) I reflect about myself a lot. (Private)

Not at all true of me

Not true of me

Somewhat true of me

True of me

Very true of me

5.) I'm not concerned about the way I present myself. (Public)

Not at all true of me

Not true of me

Somewhat true of me

True of me

Very true of me

6.) I'm often the subject of my own fantasies. (Private)

Not at all true of me

Not true of me

Somewhat true of me

True of me

Very true of me

7.) I'm not self-conscious about the way I look. (Public)

Not at all true of me

Not true of me

Somewhat true of me

True of me

Very true of me

8.) I never scrutinize myself. (Private)

Not at all true of me

Not true of me

Somewhat true of me

True of me

Very true of me

9.) I rarely worry about making a good impression. (Public)

Not at all true of me

Not true of me

Somewhat true of me

True of me

Very true of me

10.) I'm generally not attentive to my inner feelings. (Private)

Not at all true of me

Not true of me

Somewhat true of me

True of me

Very true of me

11.) One of the last things I do before I leave my house is look in the mirror. (Public)

Not at all true of me
Not true of me
Somewhat true of me
True of me
Very true of me

12.) I rarely examine my motives. (Private)

Not at all true of me
Not true of me
Somewhat true of me
True of me
Very true of me

13.) I'm not concerned about what other people think of me. (Public)

Not at all true of me
Not true of me
Somewhat true of me
True of me
Very true of me

14.) I sometimes have the feeling that I'm off somewhere watching myself.
(Private)

Not at all true of me
Not true of me
Somewhat true of me
True of me
Very true of me

15.) I'm not alert to changes in my mood. (Private)

Not at all true of me
Not true of me

Somewhat true of me

True of me

Very true of me

16.) I'm often aware of my appearance. (Public)

Not at all true of me

Not true of me

Somewhat true of me

True of me

Very true of me

17.) I'm aware of the way my mind works when I'm working through a problem. (Private)

Not at all true of me

Not true of me

Somewhat true of me

True of me

Very true of me

Motivational Orientation Measure

1.) To me, the test seems like a challenge.

Strongly agree

Somewhat agree

Neither agree nor disagree

Somewhat disagree

Strongly disagree

2.) To me, the test seems like a threat.

Strongly disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Strongly agree

3.) Overall, I think I will be successful on the test.

Strongly agree

Somewhat agree

Neither agree nor disagree

Somewhat disagree

Strongly disagree

4.) Overall, I think I have the abilities necessary for successful performance.

Strongly agree

Somewhat agree

Neither agree nor disagree

Somewhat disagree

Strongly disagree

5.) Overall, it seems that I cannot succeed on a test like this.

Strongly agree

Somewhat agree

Neither agree nor disagree

Somewhat disagree

Strongly disagree

6.) Overall, I'm worried I lack the abilities to perform well on the test.

Strongly disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Strongly agree

Appendix K: Materials for Experiment 12

Impact vs. No Impact Manipulation

The text shown to participants in the Impact and No Impact conditions is shown below. Text that varied across conditions is in bold.

Impact Condition

The test that you are about to complete has been designed to ensure that factors like anxiety and tiredness do not affect people's performance. People who are tired or anxious do not tend to perform any worse on the test than people of equal ability who are neither tired nor anxious.

No Impact Condition

Our previous research shows that factors anxiety as tiredness and stress can influence people's performance on the forthcoming test. People who are tired or anxious tend to perform worse on the test, even though they may not have lower levels of cognitive ability.

Self-Handicapping Questions

- 1.) On a scale of 1-7, how tired do you feel at the moment? 1 indicates "not at all tired"; 7 indicates "extremely tired".

1
2
3
4
5
6
7

- 2.) On a scale of 1-7, how anxious do you feel at the moment? 1 indicates "not at all anxious"; 7 indicates "extremely anxious".

1
2
3
4
5
6

Appendix L: Materials for Experiment 13

Stereotype Threat Manipulation

After the description of the motor task's point system, the following text was shown to participants in the high stereotype threat condition only.

Our past research shows that certain groups vary in their performance on this task. For instance, engineering students tend to have stronger motor skills than Psychology students and therefore perform better on this task.

Self-Awareness Manipulation

Private Self-awareness condition

Please try to think of a memory of a significant event in your past. You can pick any event you like (it can be positive or negative, for example), but please try to build a detailed image of the memory in your mind. In the space below, please write a few sentences about what was going on inside your head during this event – write about the thoughts and feelings that you experienced, the sensations that you felt in your body and the sights, sounds and smells that you perceived.

You have 2 minutes to describe your memory (you can use slightly more time if you wish). Please try to provide as much detail as possible within this time.

Public Self-awareness condition

Please try to think of a memory of a significant event in your past when you were paying attention to the way that other people were perceiving you. Please try to build a detailed image of the memory in your mind. In the space below, please write a few sentences about what was going on inside your head during this event – what impression did you make on the people who were watching you? What aspects of your behaviour or appearance were they focusing on?

You have 2 minutes to describe your memory (you can use slightly more time if you wish). Please try to provide as much detail as possible within this time.

Self-Awareness Measure

1.) Right now, I am conscious of my inner feelings.

How true is the above statement of you? Give your answer on a scale from 1 to 7, with 1 being 'strongly agree' and 7 being 'strongly disagree.'

- 1
- 2
- 3
- 4
- 5
- 6
- 7

2.) Right now, I am concerned about the way I present myself.

How true is the above statement of you? Give your answer on a scale from 1 to 7, with 1 being 'strongly agree' and 7 being 'strongly disagree.'

- 1
- 2
- 3
- 4
- 5
- 6
- 7

3.) Right now, I am reflective about my life.

How true is the above statement of you? Give your answer on a scale from 1 to 7, with 1 being 'strongly agree' and 7 being 'strongly disagree.'

- 1
- 2
- 3
- 4
- 5
- 6
- 7

4.) Right now, I am self-conscious about the way I look

How true is the above statement of you? Give your answer on a scale from 1 to 7, with 1 being 'strongly agree' and 7 being 'strongly disagree.'

- 1
- 2
- 3
- 4
- 5
- 6
- 7

5.) Right now, I am concerned about what other people think of me.

How true is the above statement of you? Give your answer on a scale from 1 to 7, with 1 being 'strongly agree' and 7 being 'strongly disagree.'

- 1
- 2
- 3
- 4
- 5
- 6
- 7

6.) Right now, I am aware of my inner-most thoughts.

How true is the above statement of you? Give your answer on a scale from 1 to 7, with 1 being 'strongly agree' and 7 being 'strongly disagree.'

- 1
- 2
- 3
- 4
- 5
- 6

