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# The effects of stereotype threat on the eating behaviours and intellectual performance of overweight and obese women

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THE EFFECTS OF STEREOTYPE THREAT ON THE EATING BEHAVIOURS AND  
INTELLECTUAL PERFORMANCE OF OVERWEIGHT AND OBESE WOMEN

by  
Karen Ip

A Dissertation  
Submitted to the Faculty of Graduate Studies  
through Psychology  
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the Degree of Doctor of Philosophy at the  
University of Windsor

Windsor, Ontario, Canada

2011

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The Effects of Stereotype Threat on the Eating Behaviours and Intellectual Performance  
of Overweight and Obese Women

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## ABSTRACT

Stereotype threat is the experience of apprehension that individuals feel in situations where their behaviour may be seen as evidence confirming a negative stereotype about their group. This threat leads to behaviour consistent with the stereotype. In contrast, unthreatened individuals perform equivalently to members of an unstereotyped group. Overweight and obese individuals are targets of many stereotypes, including the stereotypes that they lack control of their eating, and that they are less intelligent than are normal-weight individuals. Therefore, the purpose of these studies was to investigate the effects of stereotype threat on the eating behaviours and intellectual performance of overweight and obese women. It was hypothesized that overweight and obese females exposed to a stereotype threat would eat significantly more and would perform more poorly on an intellectual measure than would overweight and obese females unexposed to stereotype threat, and normal-weight participants in either condition. The performance of the latter three groups was not expected to differ. Domain identification was included as a moderator, and it was predicted that individuals highly invested in the targeted domain would be most reactive to the threat. In both Studies 1 and 2, stereotype threat was introduced with a vignette detailing discrimination against obese individuals, after which the behaviour of interest (eating in Study 1, intellectual performance in Study 2) was measured. Moreover, in both studies, weight was defined both objectively (body mass index) and subjectively (participants' self-classification). In Study 1, both the objective and the subjective weight analyses revealed that overweight participants ate more in the threat than in the control condition. Moreover, the meaning of this difference was

clarified in the subjective weight analyses: overweight participants appeared to restrict their eating in the control condition, so that the disinhibitory effect of stereotype threat simply increased their consumption to the amounts eaten by their normal-weight counterparts, whose eating was unaffected by the experimental manipulation. Study 2 did not find any evidence of stereotype-consistent behaviour (i.e., impaired intellectual performance) in overweight and obese participants following a stereotype threat.

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## Chapter I

### Introduction

#### Scope of the Problem

The World Health Organization (WHO; Organization, 2000) defines overweight and obesity according to body mass index (BMI), which is calculated as weight in kilograms divided by height in metres squared. The overweight category refers to individuals with a BMI between 25.00-29.99, while the obese category refers to individuals with a BMI of 30.00 and above. The WHO has called overweight and obesity a worldwide global epidemic; in North America alone, recent estimates of the prevalence of adulthood overweight and obesity range from 48.2% in Canada (Belanger-Ducharme & Tremblay, 2005), 58.9% in Mexico (Arroyo et al., 2000), and 66.3% in the United States (Ogden et al., 2006). The physical health consequences of overweight and obesity are numerous, and include increased risk of mortality due to weight-related diseases such as type 2 diabetes and hypertension (Thompson, Edelsberg, Colditz, Bird, & Oster, 1999). There are also social and psychological consequences, one of which the present study will examine—the impact of weight-based stigmatization, and in particular, stereotype threat, on eating behaviour and intellectual performance.

#### Weight-Based Stigmatization: Constituents and Consequences

Stigmatization occurs when individuals “have (or are believed to have) an attribute that marks them as different and leads them to be devalued in the eyes of others” (Major & O'Brien, 2005, p. 395). Weight-based stigmatization, called the “last acceptable form of discrimination” (Brownell, 2005, p.1), consists of negative attitudes

and beliefs about the overweight and obese, i.e., stereotypes, as well as prejudicial actions (Puhl, Moss-Racusin, Schwartz, & Brownell, 2008).

Stereotypes are defined as “socially shared set(s) of beliefs about traits that are characteristic of members of a social category” (Greenwald & Banaji, 1995, p. 14)<sup>1</sup>. Negative stereotypes of the overweight and obese abound, with many of them addressing domains that are unrelated to weight, such as personality, intelligence, and social and professional competence (Allon, 1982). Moreover, they are so prevalent that they have been endorsed by children as young as 3-years-old (Cramer & Steinwert, 1998), healthcare professionals who specialize in the treatment of obesity (Schwartz, Chambliss, Brownell, Blair, & Billington, 2003), and the overweight and obese themselves (Puhl, Moss-Racusin, & Schwartz, 2007).

The other constituent of weight-based stigmatization are prejudicial actions. Such acts include: unfair employment practices such as pay inequity and rejecting applicants because of weight (Fikkan & Rothblum, 2005); substandard medical treatment that may result from the reluctance of healthcare providers to examine or to even touch obese patients (Bagley, Conklin, Isherwood, Pechiulis, & Watson, 1989); and poor treatment in the public arena, including slower customer service (Pauley, 1989), and limited size accommodations in infrastructure such as transportation (O'Hara, 1996). Verbal harassment is also common; for example, a recent study found that over 75% of

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<sup>1</sup>

Stereotypes can exist within an individual or within a group (Gardner, 1994). The present research will refer to the latter given that the stereotype threat effect exists because an individual fears that others will apply stereotypes to their behaviour. Such a fear rests on the assumption that a stereotype exists at the group level.

overweight and obese individuals reported that their worst stigmatizing experiences were verbal in nature, such as teasing and insults (Puhl, Moss-Racusin, Schwartz, & Brownell, 2008).

It is reasonable to hypothesize that stigmatizing experiences such as those described above may be detrimental to the mental health of overweight and obese individuals, especially if they are experienced on a regular basis. However, research on the relationship between obesity and psychopathology is characterized by mixed results. For example, an early meta-analysis found that obesity was not associated with either depression or anxiety (M. A. Friedman & Brownell, 1995), but recent studies employing larger sample sizes have supported such a relationship (e.g., Scott, McGee, Wells, & Browne, 2008; Strine et al., 2008). Moreover, in support of obesity as a risk factor for later psychopathology, prospective studies have found that obesity is predictive of depression, pessimism, and unhappiness from one to five years post-baseline, even after controlling for factors such as baseline depression and demographic variables (Roberts, Kaplan, Shema, & Strawbridge, 2000; Roberts, Strawbridge, Deleger, & Kaplan, 2002). Markowitz, Friedman, and Arent (2008) have theorized that the experience of stigma may be one mechanism by which obesity leads to depression. Indeed, in the general population, both actual and perceived discriminatory experiences are predictive of general psychological distress and of major depressive episodes (Kessler, Mickelson, & Williams, 1999). In other words, weight-based stigmatization may be one factor that mediates the relationship between obese and overweight status on one hand, and poor mental health on the other.

Experiences of weight-based stigmatization also have been found to have behavioural consequences, especially in terms of eating. Some overweight and obese individuals who are victims of discrimination may cope by overeating and bingeing. For example, Haines, Neumark-Sztainer, Eisenberg, and Hannan (2006) found that for both male and female adolescents, weight-related teasing at baseline significantly predicted binge eating with loss of control five years later, even after controlling for demographic variables such as BMI. Moreover, in a survey of over 2000 overweight and obese women, it was found that 79% of respondents reported coping with stigmatizing experiences by eating, while 75% made a conscious decision not to diet (Puhl & Brownell, 2006). An experimental link between weight-related teasing and increased eating also has been demonstrated, albeit with binge eaters rather than with obese individuals (Aubie & Jarry, 2009). Conversely, other targeted individuals may cope by trying to lose weight. For example, in the above cited study by Haines and colleagues, the researchers reported that weight-related teasing was predictive of restrained eating in females at five years follow-up, while in males, teasing was predictive of what the authors termed “less extreme weight-control behaviours”, such as fasting, skipping meals, and cigarette smoking. Similarly, in their survey described above, Puhl & Brownell reported that 63% of their respondents coped with discrimination by dieting. Finally, decreased physical activity also has been found to be a behavioural consequence of weight-related teasing (Faith, Leone, Ayers, Heo, & Pietrobelli, 2002; Storch et al., 2007).



## **Overview of Introduction**

The above review highlights the plethora of research that has, thus far, investigated the constituents as well as the psychological and behavioural consequences of weight-based stigmatization. The majority of this research is based on self-report, and is either descriptive or correlational in nature. Few studies to date have investigated experimentally the link between stigmatization and its effects. One method of introducing stigma in the laboratory is through stereotype threat, which refers to the threat of having one's actions used to confirm stereotypes about one's group (Steele & Aronson, 1995). This threat has been found to impact subsequent behaviour, so that it paradoxically accords with the stereotype (Steele, 1997). The purpose of the current studies is to investigate the impact of stereotype threat on the eating and intellectual performance of overweight and obese individuals. These two studies represent the first empirical examination of stereotype threat in this population.

The following literature review will examine common stereotypes about the overweight and obese. In particular, it will focus on the stereotypes that these individuals lack self-control over their eating and that they are less intelligent than are individuals of normal weight. Then, empirical research on stereotype threat will be reviewed, before discussing the present research.

## **Weight-based Stereotypes**

As mentioned above, negative stereotypes about the overweight and obese are abundant, and many of them pertain to domains that are unrelated to weight. Studies in this area have employed a general research paradigm in which respondents rate

overweight and obese individuals (either with the assistance of stimuli such as photographs or figure drawings, or no stimuli) on Likert scales anchored by bipolar adjective pairs (e.g., ugly–beautiful). Other studies have administered empirically validated measures, such as the Attitudes Toward Obese Persons Scale and the Beliefs About Obese Persons Scale (Allison, Basile, & Yuker, 1991). Both types of methodology have revealed common stereotypes about the overweight and obese, including the beliefs that they: are lazy (Chambliss, Finley, & Blair, 2004); are socially incompetent–e.g., clash with others and are lonely (Klesges, Eck, Hanson, Haddock, & Klesges, 1990); have poor personal hygiene–e.g., are dishevelled and sloppy (Dianne Neumark-Sztainer, Story, & Harris, 1999); possess negative personality traits–e.g., are hostile, mean and unpleasant (Blumberg & Mellis, 1985); have psychopathological characteristics such as emotional instability or unresolved anger (Maroney & Golub, 1992; Roehling, 1999); are professionally incompetent–e.g. are unproductive and unable to withstand hard work (Klesges et al., 1990; Larkin & Pines, 1979); exhibit poor self-control over their eating (DeJong, 1993); and possess inferior intellectual abilities (Harris, Harris, & Bochner, 1982; Hebl & Heatherton, 1998). The latter two stereotypes will be discussed in greater depth below, as they form the basis of the present investigation.

**Stereotype of poor self-control.** The stereotype that overweight and obese individuals lack control over their eating is widespread, and is related to the prevailing belief that overeating is one of the main causes of overweight and obesity (J. M. Friedman, 2000). However, it must be noted that this stereotype has some support, in that research has found that overweight and obese individuals do eat more than do normal-

weight individuals (Prentice et al., 1986), in part because their increased mass necessitates more energy to sustain bodily functions and activities (Cutler, Glaeser, & Shapiro, 2003). However, while it may be accurate to characterize overweight and obese individuals as eating more than do normal-weight individuals, what is debatable is whether this increased consumption is due to a moral and character failing (as is implied in stereotyping and blaming), or whether it can be attributed to other factors, such as genetics or physiology (J. M. Friedman, 2000).

Research has demonstrated the existence of the stereotype that overweight and obese individuals lack control of their eating, and thus overeat. For example, in an investigation of young adults' beliefs about the causes of common health problems, the main contributors to obesity were rated as ones related to individual effort, such as lack of willpower, inner strength, and self-control (Furnham & McDermott, 1994). In fact, this study found that the degree of attribution to lack of personal effort as a cause of obesity was comparable to that of drug addiction. This stereotype is endorsed by children as well; for example, Tiggemann & Anesbury (2000) found that over half of their sample of fourth to sixth graders endorsed eating too much as a cause of obesity, while 36% cited lack of willpower as another cause. Even professionals who are supposedly familiar with the multidimensional causes of obesity are not immune from believing this stereotype. For example, in a survey of over 600 primary care physicians, overeating was endorsed as the second most important cause of obesity, behind physical inactivity (Foster et al., 2003). In fact, this sample rated lack of willpower as a more significant contributor than physical factors such as metabolic and endocrinological abnormalities.

A consequence of the stereotype that overweight and obese individuals are unable to control their eating is that they are often blamed for causing their condition (Allon, 1982). For example, in a study investigating beliefs about obesity in both children and adults, 55% of respondents endorsed that it is the individual's own fault for being fat, while other factors, such as biology (0.5%) and culture/environment (1%) were rarely acknowledged (Harris & Smith, 1982). Again, professionals hold similar views to those of laypersons—one survey found that both general practitioners and clinical psychologists held overweight and obese patients moderately responsible for changing their condition, such as by motivating themselves to lose weight (Harvey & Hill, 2001). Holding this group responsible for change may reflect implicit assumptions that obese individuals are primarily responsible for their weight gain. The culture of blame has become so insidious that it is even endorsed by the overweight and obese themselves. For example, Harris, Waschull, and Walters (1990) found that 93% of their sample of overweight individuals reported blaming themselves for their weight status, and cited feelings of loss of control as one factor contributing to their guilt. Moreover, there is evidence suggesting that it may be the default explanation for obesity in the absence of alternative accounts. For example, DeJong (1993) found that nonobese adolescent girls rated an obese target as less self-disciplined than a normal-weight target, but that this bias disappeared when the obesity was attributed to a glandular condition. Therefore, without an external explanation, participants automatically attributed weight gain to an internal failure of control.

Crandall (1994) proposed that one reason why this blaming occurs is because of

the attributions that are made regarding the causes of obesity. Attributions are causal explanations for an outcome, and in the current North American worldview, there is a strong emphasis on the “Protestant work ethic, self-determination, a belief in a just world, and the notion that people get what they deserve” (Crandall, 1994, p. 884). This worldview consequently leads to blame being placed on the individual for causing their own misfortune (Crandall, 1994), as is exemplified in the stereotype that overweight and obesity are caused by lack of discipline over eating. In other words, weight gain is attributed to an individual’s volitional decision to eat (or alternatively, volitional decision to not cease eating).

Furthermore, the stereotype that overweight and obese individuals lack control of their eating, and the subsequent blaming, all have been found to be associated with negative affect and evaluations towards this group. For example, in a validation study of the Antifat Attitudes (AFA) questionnaire, the Willpower and Dislike subscales of this measure were significantly positively correlated, indicating that stronger beliefs about the controllability of weight were associated with greater dislike of the overweight and obese (Crandall, 1994). In Study 2 of this research, Crandall found that high scores on measures of belief in a just world, Protestant ethics, and conservative politics (all of which reflect an emphasis on individual responsibility) were positively related to all three subscales of the AFA questionnaire, including Fear of Fat, which reflects self-relevant concerns about weight. Moreover, Quinn and Crocker (1999) reported that in women who self-identified as being “very overweight”(defined by the authors as being more than 15 pounds overweight), belief in the Protestant ethic was correlated with decreased

psychological well-being. This demonstrates that the overweight and obese themselves are susceptible to detrimental affective consequences if they have a tendency to attribute their weight to character failings. Overall, this body of research suggests that the stereotype of lack of control over eating may lead to blaming of overweight and obese individuals for their condition, which may in turn lead to negative evaluations of this group (Puhl & Brownell, 2003b).

**Stereotype of intellectual inferiority.** Overweight and obese individuals also have been stereotyped as being intellectually inferior to their nonobese counterparts. Such a view is often propagated by the media, where “fat is synonymous with stupid” (Davison & Birch, 2001, p. 51). Numerous studies have found that children and adults alike attribute low intelligence and stupidity to endomorphic line drawings (Butler, Ryckman, Thornton, & Bouchard, 1993; Musher-Eizenman, Holub, Miller, Goldstein, & Edwards-Leeper, 2004; Ryckman, Robbins, Kaczor, & Gold, 1989; Staffieri, 1967). Moreover, there is evidence that overweight children apply this stereotype to themselves: Davison and Birch found that overweight 5-year-old girls rated their cognitive ability as being significantly lower than did nonoverweight girls.

Like the stereotype that overweight and obese individuals lack control over their eating, the stereotype of unintelligence also has been supported by empirical research. In particular, a small number of studies have shown an inverse relationship between weight and intelligence in both adults and children, with obese samples obtaining lower test scores than do nonobese samples (e.g., Li, 1995; Teasdale, Sorensen, & Stunkard, 1992). Moreover, in a prospective study, Chandola, Deary, Blane, and Batty (2006) found that

intelligence test scores obtained at age 11 predicted obesity status at age 42, although this relationship was significantly attenuated after controlling for educational achievement. In addition, their results indicated that the association between childhood intelligence and BMI in middle age was not a direct one, but was instead mediated by factors such as educational level and adulthood diet.

Akin to the discussion on the meaning of empirical findings on the stereotype of lack of control, a similar issue arises in the present case, as to whether the demonstration of inferior intelligence in the obese is attributable to an internal characteristic (i.e., that they intrinsically have lower intelligence) or to external causes. Chandola and colleagues (2006) present hypotheses regarding the environmental factors that may contribute to the low intelligence-obesity relationship. For example, given the stigmatizing nature of obesity, others may treat the overweight or obese child in a manner that depresses their cognitive development (Chandola et al., 2006). In indirect support of this possibility, Neumark-Sztainer and colleagues (1999) found that over 20% of high school staff hold negative stereotypes of obese individuals, with almost half of the sample agreeing that most people are uncomfortable when associating with the obese. These beliefs may then consciously or unconsciously lead staff to discriminate against overweight and obese students, such as by devoting less attention to them (Puhl & Brownell, 2003a). These students may even face discrimination from their own families. For example, Crandall (1991) found that overweight college students received less financial support from their families, even after controlling for parental education and income, and siblings' college attendance. Low educational attainment, through limited career options, may then

deprive at-risk individuals of lifestyle and financial resources that may serve as protective factors against further weight gain (e.g., free time to exercise, funds to access quality nutrition; Chandola, Deary, Blane, & Batty, 2006). Alternatively, other factors such as genetics, prenatal conditions, and socioeconomic status may all serve as risk factors to both obesity and low intelligence (Chandola et al., 2006).

Another environmental factor that may lead to depressed cognitive performance as well as low control over eating in overweight and obese individuals is stereotype threat. Briefly, overweight and obese individuals may eat more or underperform cognitively when stereotypes about their group are activated, in accordance with the stereotype threat effect. This phenomenon will be discussed in greater detail in the following section.

### **Stereotype Threat**

**Definition.** Stereotype threat can be experienced by any member of a group for whom a stereotype exists (Spencer, Steele, & Quinn, 1999). It is the experience of apprehension that such individuals feel in situations where their behaviour may be seen as evidence confirming a stereotype about their group (Steele & Aronson, 1995). In other words, the stereotype is made relevant to the situation, such that there is a threat that it will be used to interpret subsequent behaviour (Aronson, Lustina, Good, & Keough, 1999). Ironically, this threat then affects performance, such that it is consistent with the predictions of the stereotype (Schmader, Johns, & Barquissau, 2004; Steele & Aronson, 1995). Although theoretically, stereotype threat can occur in situations where either positive or negative stereotypes are made salient, the majority of extant research has



focussed on negative stereotypes about women and individuals of ethnic minorities. This literature will be briefly reviewed before focussing on the present studies.

**Empirical demonstrations.**

*Stereotype threat in African-Americans.* In the first experiment to empirically investigate the effects of stereotype threat, Steele and Aronson (1995) examined the impact of activating the stereotype of Blacks' intellectual inferiority on the performance of African-American undergraduate students on a verbal task. In the first of a series of studies, White and Black students completed items from the verbal section of the Graduate Record Examination under two conditions. In the stereotype threat condition, participants were told that the items comprised a test of verbal ability, and that their performance would illuminate their verbal strengths and weaknesses. This was hypothesized to be threatening for Black students, as the instructions were expected to activate the stereotype of their race's supposed lesser intelligence, and consequently lead to concern of confirming the stereotype. In the control condition, no reference was made to intelligence or verbal ability; instead, the rationale was that the task would assist in the examination of psychological problem-solving factors. For White participants, neither condition was expected to be threatening, as negative stereotypes about their intellectual ability generally do not exist. Thus, their performance in both conditions was predicted to be equivalent. However, for Black participants, it was hypothesized that performance in the threat condition would be diminished in comparison to performance in the control condition, which would provide evidence for the impairing effects of stereotype threat. This prediction was supported: threatened Black participants answered significantly

fewer items correctly than did unthreatened Black participants and White participants in either condition; the pattern was identical when accuracy was examined. Moreover, unthreatened Black participants' performance was indistinguishable from that of White participants.

In a subsequent study (study 4), Steele and Aronson (1995) varied the manner by which stereotype threat was introduced—the verbal task was presented as unrelated to intellectual ability for all participants; instead, race had to be recorded before the task. It was hypothesized that merely introducing race would be enough to depress the performance of Black participants, by making racial stereotypes potentially relevant to their performance. Once again, this hypothesis was supported: Black participants who had to indicate their race before the verbal task answered significantly fewer items correctly than did all other groups (i.e., Black participants who did not have to indicate race, White participants in either condition). In contrast, the performance of unthreatened Black participants was equivalent to that of White participants. Thus, this study showed that simply highlighting social identity was sufficient to activate the stereotype of intellectual inferiority in Black participants, and consequently negatively impact their performance.

***Stereotype threat in women.*** Another extensively studied area in the literature pertains to the stereotype that women are inferior to men in mathematical ability. The impact of making this stereotype relevant to women's math performance was first investigated in a series of studies by Spencer and colleagues (1999). In one study, the researchers had male and female undergraduate students complete a difficult math test.

In the stereotype threat condition, participants were informed that the test had produced gender differences in the past; in the neutral condition, participants were explicitly informed that the test had shown no such differences. Results demonstrated the stereotype threat effect: women who were told about the gender differences scored significantly lower than did men in the same condition, while in the gender-neutral condition, the performance of men and women were equivalent.

However, it must be noted that the priming of stereotypes does not always result in detriments in performance. Just as activating negative stereotypes has been found to have a negative effect on performance, the activation of positive stereotypes has been found to have a subsequent positive effect. For example, in one study, Shih, Pittinsky, and Ambady (1999) investigated the differential effects of highlighting either Asian or female identity on the math performance of Asian females. It was hypothesized that participants who had their Asian identity primed should perform better, since this identity should activate the stereotype of Asian superiority in math. Conversely, participants who had their female identity highlighted were expected to underperform, in accordance with the traditional gender-math stereotype threat effect. In the study, participants completed a questionnaire that highlighted one aspect of their identity (or a neutral survey in the control condition), before completing a difficult math test. Results supported the researchers' hypothesis: participants in the Asian-identity-salient condition had the highest degree of accuracy, followed by participants in the control condition, and finally by participants in the female-identity-salient condition.

***Stereotype threat in traditionally non-stereotyped groups.*** Although the majority

of stereotype threat research has focussed on stereotypes of intellectual ability in ethnic or gender groups, there is also research on stereotypes in other domains, and in groups who are not traditional targets of stereotyping. For example, one study examined the impact of activating the stereotype that Whites are racist on White participants' subsequent performance on an implicit measure of racial preferences (the Implicit Associations Test or IAT; Frantz, Cuddy, Burnett, Ray, & Hart, 2004). In the first experiment, White undergraduate students were presented with the IAT under three conditions. In the explicit threat condition, participants were told that the IAT assessed racial bias; in the explicit no-threat condition, participants were told that the IAT assessed cultural stereotypes; and in the control condition, participants were given no information regarding the task. It was found that participants in the explicit threat condition showed a significantly greater pro-white IAT effect than did participants in the explicit no-threat condition, meaning that those who were concerned about appearing racist paradoxically provided evidence for it. Thus, this study showed that even a group that is not historically stigmatized (i.e., Whites) can be prone to performing in a stereotypical fashion in situations where a stereotype may be relevant to judging their performance. Moreover, it was shown that stereotype threat also can apply to tasks that involve lower-order cognitive processing (Frantz et al., 2004).

As another example of a lower-order cognitive task, Stone, Lynch, Sjomeling, and Darley (1999) investigated the area of athletic ability, as the authors noted that there are different stereotypes regarding Blacks' and Whites' athleticism. Specifically, Blacks are stereotyped as possessing natural talent but lacking in sports intelligence (reflecting an

extension of the stereotype of unintelligence), while the reverse is stereotyped of Whites. Thus, in their first of a series of studies, the authors predicted that depending on how a golfing task was presented (either as a measure of natural athletic ability or of sports intelligence), Blacks' and Whites' performance should be differentially impacted by stereotype threat. Specifically, when Blacks are informed that the task reflects sports intelligence, they should perform worse than will Whites in the same condition or Blacks in the natural ability condition, because they will be concerned about confirming the stereotype of their race's inferior intellect. The reverse pattern was predicted for White participants (i.e., their worst performance should be in the natural ability condition). Results obtained with Black participants were consistent with these hypotheses, as individuals in the intelligence condition completed the golf task with significantly more strokes (reflecting poorer performance) than did individuals in the natural ability condition or the control condition (where the task was presented as one of "general sports performance"). However, results with White participants provided only partial confirmation: although Whites in the natural ability condition performed significantly worse than did Whites in the sports intelligence condition, their performance in the former condition was not significantly different from their performance in the control condition. In other words, White participants performed no worse under a stereotype threat than in a control condition.

However, in a subsequent study of only White participants and involving the threat (i.e., natural ability) and control conditions, the stereotype threat effect was obtained, although a moderating variable was identified. Specifically, only the

performance of White participants whose self-worth was based on athletic ability suffered under threat. Therefore, identification with the threatened domain may have partially moderated the stereotype threat effect. Further research on this moderator will be discussed in the “domain identification as a moderator” section.

*Stereotype threat in overweight and obese individuals.* Only one study could be located that examined the effects of stereotype threat on overweight individuals, and specifically, on their intentions to maintain a healthy diet and exercise regimen (Seacat & Mickelson, 2009). In this study, one hundred overweight and obese women (i.e., BMI  $\geq$  25) were interviewed on the telephone. In the stereotype threat condition, participants received a description of a study that ended with a statement that certain women were more likely than others to practice poor exercise and diet; immediately following, they reported their height and weight. In the control condition, participants were informed about the study but without the critical statement, and they provided height and weight only at the end of the study. Results revealed that threatened women endorsed significantly lower dietary and exercise health intentions than did unthreatened women, and that this was partially mediated by feelings of self-efficacy in these domains. In other words, when weight was made relevant to their self-reports, overweight participants endorsed intentions that confirmed the stereotypes of their groups’ unhealthiness and laziness. This may have been due to these stereotypes decreasing their confidence that they could indeed enact healthful behaviours (with confidence represented by self-efficacy). Although the findings of this study are consistent with the stereotype threat effect, actual behaviour following a threat was not assessed. This is a crucial limitation

because the behavioural consequences of stereotype threat are robust, and form the crux of this research. In contrast, the present studies will be the first to experimentally examine the behavioural consequences of stereotype threat in overweight and obese women.

Another study investigated stereotype threat spillover, which occurs when the behavioural detriments caused by stereotype threat extends to performance in domains unrelated to, and following, the targeted one. In one of a series of experiments, Inzlicht and Kang (2010) had women complete a difficult math test either after having received instructions for cognitive reappraisal (the non-threatening condition) or without further intervention (the stereotype threat condition, since it has been demonstrated that the stereotype of women's inferior math ability is active in the absence of explicit disconfirmation; Spencer et al., 1999). Then, they participated in an ice cream taste test—a task that is unrelated to the stereotype of women's inferior mathematical skills. Regardless, women in the threat condition ate more than did women in the non-threatening condition, which was attributed to the fact that the threat depleted enough cognitive resources to weaken volitional self-control of consumption. Thus, although this study did not activate eating stereotypes specifically or focus on a group for which such activation would be relevant, it nevertheless showed that control of eating can be weakened even when individuals receive a stereotype threat in another domain.

**Domain identification as a moderator to the stereotype threat effect.** Domain identification is defined as the “degree to which a person stakes their self-image on a given ability” (Aronson et al., 1999, p. 42). Aronson and colleagues were the first to

investigate domain identification as a moderator to the stereotype threat effect, as they reasoned that individuals should be threatened by the possibility of having their performance confirm a negative group stereotype only if they care about the domain in question. This hypothesis was investigated in a group of White, male, university students who were identified as either moderately or highly invested in mathematics. In the stereotype threat condition, participants completed a calculus test under the guise of understanding why Asians are superior to other groups in math. In the control condition, the research was presented as investigating the cognitive processes involved in math ability. Highly invested participants performed significantly worse in the stereotype threat condition than in the control condition. The opposite pattern was obtained with moderately invested participants, who performed significantly better under stereotype threat than in the control condition. Moreover, highly invested participants were more concerned about being evaluated in the threat than in the control condition. These results were interpreted to indicate that moderately invested participants were able to excel when presented with the challenge of disconfirming the stereotype of Asian mathematical superiority, whereas highly invested participants may have been too distracted by evaluation apprehension. The authors concluded that highly invested individuals may be “penalized for their devotion” (p. 43) in threatening situations.

Domain identification also has been identified as a moderator to the stereotype threat effect in areas aside from intellectual performance. For example, in an extension of their first study, Frantz et al. (2004) investigated individual differences in motivation to appear unprejudiced as a moderator in the threat-IAT relationship. In the explicit



threat condition, participants were informed about the true nature of the IAT, whereas in the masked threat condition, participants were given a fictitious rationale regarding colour categorization. Moreover, within the masked threat condition, participants who were suspicious about the racial nature of the IAT were classified into a third and separate condition—suspected threat. Results supported the stereotype threat effect: participants in the suspected and explicit threat conditions showed a significantly greater IAT effect in favour of Whites than did participants in the masked threat condition. However, domain identification moderated this relationship: individuals highly motivated to appear unprejudiced showed a significantly greater IAT effect under conditions of stereotype threat than not, whereas the IAT scores of individuals low in motivation did not vary by condition. Thus, when stereotype threat was present, individuals for whom it was important to present as nonracist paradoxically responded in a manner that made them appear to be the most biased.

**Summary of stereotype threat literature.** In summary, any member of a group for whom stereotypes exist may experience, in certain circumstances, the predicament that their actions will be judged as confirming the stereotype. This experience is termed stereotype threat. The behavioural consequence of experiencing stereotype threat is that the targeted individual then acts in a manner predicted by the stereotype, paradoxically reinforcing it. However, the consequences of stereotype threat are situational, as unthreatened members of the stigmatized group do not behave in a stereotype-consistent manner. Moreover, there are individual differences in susceptibility to stereotype threat, such that identification with the threatened domain acts as a moderator.

Researchers have noted that for stereotype threat to occur, relevant group stereotypes should be widely known, and membership in the stigmatized group should be publicly observable (Frantz et al., 2004; Shapiro & Neuberg, 2007). These two conditions are met in stereotyping of overweight and obese individuals—as discussed above, stereotypes about this group are prevalent, and their weight is a characteristic that is difficult to conceal. Thus, overweight and obese individuals are in a predicament similar to that of other stereotyped groups, such that they may also feel at risk of having their performance judged as confirming negative group stereotypes, including those that involve eating and intellectual performance. This possibility was investigated in the present studies.

### **Overview of Experiments**

The present research examined the impact of stereotype threat on the behaviours of overweight and obese undergraduate female students. In two studies, a stereotype threat was introduced, and the subsequent impact on two behavioural domains—eating and intellectual ability—was examined. In both studies, domain identification, manifested as either investment in appearance or in academic achievement, was included as a potential moderator.

Stereotype threat was introduced in both studies using a written vignette that described discrimination against obese individuals. This vignette did not explicitly refer to a particular stereotype about the obese; instead, it increased the salience of being obese by describing discrimination against this group. This was done because previous research has found that the stereotype threat effect is elicited by simply highlighting an aspect of

participants' social identity that may be subject to subsequent stereotyping or negative judgment (e.g., Inzlicht & Ben-Zeev, 2000, Steele & Aronson, 1995). Moreover, research has indicated that the behaviour of targeted individuals is affected by subtle stereotype activation (e.g., subliminal priming with stereotypical words) but not by explicit manipulation (e.g., Levy, 1996; Shih, Ambady, Richeson, Fujita, & Gray, 2002). To account for this finding, Levy suggested that blatant interventions may lead to participants' discounting or challenging of the stereotypes, whereas implicit interventions may bypass awareness to exert an influence on cognitive processes and actual performance.

Across the studies, it was broadly hypothesized that when weight-based stereotypes were activated by reading about examples of discriminatory behaviour, overweight and obese participants would experience stereotype threat (i.e., the concern that their performance would confirm the stereotype). Consequently, their behaviour would be impacted such that it would accord with the stereotype. Participants in the underweight or normal-weight range served as a control group in both studies, as it was hypothesized that they would not be affected by reading about discrimination against the obese, or any stereotypes that may arise as a result, since they do not belong to the stereotyped group.

Finally, in stereotype threat research examining stereotypes associated with race and gender, inclusion in the stigmatized group (e.g., Blacks and females) is usually unambiguous and apparent to the group members. However, this self-awareness may be more complex for weight status. Specifically, some individuals who would objectively

be classified as either overweight or obese based on their BMI, may perceive themselves to be of normal-weight. This may be especially likely for individuals who just meet criteria for overweight classification. Conversely, other individuals may believe that they are overweight or obese, even when their objective BMI is in the normal range. This may occur for those in the upper end of the normal-weight range, but may also be observed in those who have body image concerns, as such concerns often lead to overestimations of body size and weight (Strauman & Glenberg, 1994). The subjectivity of weight status may affect the present experiments such that some participants may not react to stereotype threat in the predicted manner, because they do not identify with their objective BMI group. Therefore, in addition to having their weight and height measured to calculate their BMI, participants also were asked to self-classify their weight status. Thus, all analyses were performed twice, with objective and then subjective BMI status treated as independent variables.

## Chapter II

### Study 1

#### **Purpose and Hypotheses of Study 1**

The purpose of Study 1 was to investigate the effects of stereotype threat on overweight and obese female undergraduate students' eating behaviours. It was hypothesized that overweight and obese participants (defined either objectively or subjectively) exposed to a stereotype threat would eat significantly more than would overweight and obese participants unexposed to a stereotype threat, and normal-weight participants in either condition, all of whose eating was not expected to differ. It was

further hypothesized that investment in appearance would moderate the interaction between stereotype threat and weight, such that highly invested overweight participants in the stereotype threat condition would eat more than would: (a) highly invested overweight participants in the control condition, (b) lowly invested overweight participants in either condition, and (c) normal-weight participants in either condition, regardless of appearance investment. The eating of all other groups was not expected to significantly differ from each other, given that stereotype threat should not affect normal-weight participants, or overweight participants who are less invested in their appearance.

State mood and self-esteem, as well as subjective feelings of threat, also were examined as dependent variables to investigate psychological state following stereotype threat. No hypotheses for these outcomes were formulated because the empirical research on them remains inconsistent. For example, in terms of mood, while some studies have found that negative affective states such as anxiety and frustration were more pronounced in threatened than in unthreatened individuals (e.g., Bosson, Haymovitz, & Pinel, 2004; Marx & Stapel, 2006), other studies have not found an association between threat and affect (e.g., Blanton, Crocker, & Miller, 2000; Gonzales, Blanton, & Williams, 2002; Keller & Dauenheimer, 2003). Similarly, while some studies have found that threatened group members reported greater feelings of threat than did unthreatened group members (e.g., Schmader et al., 2004), others have found that threat endorsement was not specific to the targeted group (e.g., Schmader & Johns, 2003; Steele & Aronson, 1995). Finally, most studies that have included state self-esteem as a dependent variable have not found that it varied as a function of threat manipulation

(Lesko & Corpus, 2006; Oswald & Harvey, 2000).

## **Method**

**Participants.** One hundred and sixty-four female undergraduate students were recruited from the University of Windsor Department of Psychology participant pool. Only female participants were recruited because there is greater sociocultural pressure on females to attain the thin ideal (Polivy & Herman, 2004), and thus they may be more frequent targets of more severe stigmatization (Chen & Brown, 2005; Regan, 1996). As a result, they may be more susceptible to stereotype threat.

To qualify for the present study, participants must have met three selection criteria. Firstly, they must not currently have, nor have ever been diagnosed with, an eating disorder. This was assessed with a screening question (“Have you ever had or do you currently have a diagnosis of an eating disorder?”) that all students who registered for the participant pool completed. Secondly, because this study required participants to consume various types of chocolate, they could not have a chocolate or peanut allergy, nor diabetes. This was assessed with the screening questions—“Do you have an allergy to chocolate or peanuts?” and “Do you have diabetes?” Finally, participants could not have previously participated in any study conducted by the Eating Disorders and Anxiety Research Group, because many of this group’s studies involve eating. The names of previous participants were stored on the participant pool system, and only naive participants were contacted or could view the study.

Fourteen participants were excluded from the analyses, yielding a final sample of 150 participants. Eleven participants were excluded because they reported during

debriefing that they suspected that the amount they ate would be measured, which was problematic as cognitive factors other than stereotype threat may have influenced eating. During debriefing, it was also revealed that two participants had participated in this lab's studies previously, and one participant reported having had an eating disorder.

Objectively overweight and obese individuals were combined into one category, as previous studies have found that the prevalence of obesity in American college samples was low, ranging from 5-11% (Hlaing, Nath, & Huffman, 2007; Lowry et al., 2000). However, the same studies found that the prevalence of overweight and obesity combined was between 28-35%. Similarly, in the present study, only 16.7% ( $n = 25$ ) of participants were objectively obese, while 44% were either overweight or obese<sup>2</sup> (overweight  $n = 41$ ). Underweight and normal-weight participants were also combined into one group, as the studies cited above found that the frequency of underweight students was low (estimates ranged from 4-5%). Indeed, in this study, while only 6% of participants were underweight ( $n = 9$ ), 54% were either objectively underweight or normal-weight (normal-weight  $n = 72$ ). Table 1 displays BMI and age stratified by each of the independent variables (objective and subjective weights, experimental condition, and investment category). Because the mean BMI of the objectively overweight/obese

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<sup>2</sup>

For nine participants who did not consent to having their weight and height measured to calculate their BMI, their self-reported weight and height were used to estimate their BMI. Moreover, three participants did not consent to having their weight and height assessed, nor did they provide estimates of these measurements, and thus their data could only be included in the subjective weight analyses.

Table 1

*Body Mass Index and Age Stratified by Objective Weight, Subjective Weight, Threat Condition, and Appearance Investment*

	Total Sample	Objective Weight		Subjective Weight		Experimental Condition		Appearance Investment	
		Underweight/ Normal-weight	Overweight/ Obese	Underweight/ Normal-weight	Overweight/ Obese	Control	Threat	Low	High
<i>n</i>	150	81	66	87	63	72	78	70	80
BMI	24.96 (5.40)	21.00 (2.10) <sup>a</sup>	29.83 (4.04) <sup>b</sup>	21.83 (2.87) <sup>a</sup>	29.38 (5.02) <sup>b</sup>	25.37 (5.89)	24.59 (4.91)	24.77 (5.40)	25.14 (5.42)
Age	24.03 (8.02)	21.47 (4.67) <sup>a</sup>	27.44 (9.94) <sup>b</sup>	21.89 (4.98) <sup>a</sup>	26.98 (10.24) <sup>b</sup>	24.53 (7.99)	23.56 (8.07)	25.66 (9.23) <sup>a</sup>	22.60 (6.51) <sup>b</sup>

*Note.* BMI = body mass index.

a-b. Significantly different at the 0.05 level in comparisons within each independent variable category.

and underweight/normal-weight groups were in the overweight and normal-weight range, these terms will be used in Study 1



to refer to these two groups.

In terms of subjective weight, the overweight and obese categories were again combined, as were the underweight and normal-weight categories, because the frequency of self-classified underweight and obese participants was low (4.7% and 2.7%, or *ns* of 7 and 4, respectively). Following this procedure, 58% of participants identified themselves as underweight or normal-weight (normal-weight  $n = 80$ ), while 42% identified as being overweight or obese (overweight  $n = 59$ ). Given that the majority of the sample self-identified as being either normal-weight or overweight, these classifications will be used to refer to the two weight categories in the Study 1 subjective weight analyses. Chi-square analyses indicated that subjective weight classification did not vary by threat condition or investment category (all  $ps > 0.07$ ).

Participants' self-reported ethnicity was as follows: 79.3% were Caucasian, 8.7% were African-Canadian, 2.6% were Asian, 2.0% were Middle Eastern, 0.7% were Hispanic, 0.7% were Native-Canadian, and 6.0% identified an "other" ethnicity (e.g., biracial).

**Design.** The study employed a 2 x 2 x 2 factorial design, with stereotype threat (presence or absence), weight status (objectively/subjectively overweight or normal-weight), and appearance investment (high or low) as between-subjects factors. Participants were classified as high or low in investment through a median split of total scores on the Appearance Schemas Inventory-Revised. Because both the independent

variables (experimental condition and weight status) and the hypothesized moderator (investment) were treated as dichotomous variables, the exploration of a moderating relationship with Analysis of Variance (ANOVA) is appropriate (Baron & Kenny, 1986). The relationships relevant to our hypotheses would be indicated by significant two- or three-way interactions.

### **Materials.**

*Food stimuli.* The food stimuli employed in this study was based on that used in another study conducted in the same laboratory (Aubie & Jarry, 2009). Three types of chocolate candies—M&M’s, Smarties, and Reese’s Pieces—were used. Each type of candy was placed in a separate but identical bowl. Participants were presented with a full bowl of each candy; however, because the candies differed in size, a different number were put in each to achieve a full bowl (200 Smarties, 250 M&M’s, 300 Reese’s Pieces). For each participant, each bowl of candy was randomly designated as “A”, “B”, or “C”.

Using the same food stimuli and presentation, Aubie and Jarry detected differences in the amounts eaten by binge and non-binge eaters. Moreover, consumption in binge eaters was responsive to an experimental manipulation of reading about weight-related teasing. In another study of overweight and obese individuals, it was found that intake of M&Ms was significantly correlated with cravings for fast foods and sweets (Martin, O’Neil, Tollefsonc, Greenwaya, & Whited, 2008). This provides evidence that overweight and obese individuals modified their eating in a laboratory experiment in response to internal stimuli, and that chocolate candies were effective in detecting these differences in eating.

**Vignettes.** Stereotype threat in the experimental condition was introduced with an excerpt from a journal article by Puhl and Brownell (2001; Appendix A). This excerpt described discrimination of the obese in public accommodations; in particular, that they are often forced to buy two seats on public transportation to accommodate their size. The target vignette was accompanied by three distractor vignettes on approximately the same topic—social issues in transportation. A similar theme was chosen to ensure that the target remained somewhat inconspicuous, to reduce participants' suspicions. The distractor vignettes were on the following topics: hybrid vehicles, carbon offsetting programs, and the social consequences of increased car usage (Appendices B-D). They were all cited from internet newsletters. None of the distractor vignettes referred to the overweight or obese, food, eating, stereotypes, or discrimination.

In the control condition, the target vignette was replaced with one regarding the banning of animals on aeroplanes (Appendix E). This passage was chosen because like the target vignette, it discussed the topic of limited access for a certain group in the realm of transportation. However, it made no reference to the overweight or obese, food, eating, or stereotypes.

All vignettes ranged from 144-169 words, and the Flesch-Kincaid reading grade level (as determined by Microsoft Word) of the documents ranged from 10.3-14.0, which means that they were in the readability range for university students.

**Measures.** Table 2 outlines the measures used in Study 1, and their function in the statistical analyses.

Table 2

*Measures Used in Study 1 and Their Function in the Statistical Analyses*

Independent Variable
Appearance Schemas Inventory–Revised
Dependent Variables
Positive and Negative Affect Schedule–Expanded Form
State Self-Esteem Scale
Stereotype Threat Assessment
Potential Covariates
Beck Depression Inventory-II
Binge Scale
Hunger Ratings
Revised Restraint Scale
Rosenberg Self-Esteem Scale
Other
Demographic Questionnaire

***Appearance Schemas Inventory-Revised (ASI-R)***. The ASI-R is a 20-item self-report measure that assessed the investment component of body image, or in other words, the importance of physical appearance to an individual (Cash, Melnyk, & Hrabosky, 2004). In addition to a total composite score, this measure yielded two subscales—Self-Evaluative Salience and Motivational Salience. Only the total score was used in this study to classify individuals as being either high or low in appearance investment, since it accounts for both the attitudes and the behaviours that constitute appearance schematicity. Participants indicated their agreement with each item on a 5-point Likert scale, from 1 (“strongly disagree”) to 5 (“strongly agree”). The total score was calculated by obtaining the mean of all items, with higher scores indicative of greater degrees of investment.

In a preliminary investigation, Cash et al. (2004) reported that the internal consistency (Cronbach’s alpha) of the total ASI-R was 0.88. Convergent validity was good, as the ASI-R was significantly correlated with other body image measures such as the Body Image Ideals-Questionnaire and the Situational Inventory of Body-Image Dysphoria.

***Beck Depression Inventory-II (BDI-II)***. The BDI-II is a 21-item self-report measure that assessed symptoms of clinical depression (Beck, Steer, & Brown, 1996). For each item, which represented a symptom of depression (e.g., fatigue, feelings of sadness), four statements of increasing severity (0-3) were presented. However, for the items assessing changes in sleep and appetite, seven statements were presented, given that changes in these areas could be either greater or less than baseline (e.g., an individual

could either endorse having slept more or less than usual). Participants were instructed to respond based on their feelings during the past two weeks, and to select only one statement per item. A total score was calculated by summing all responses, with higher scores indicative of greater severity of depressive symptoms.

In undergraduate students, the internal consistency of the BDI-II is high; for example, two studies found Cronbach's alphas ranging from 0.90 to 0.91 (Dozois, Dobson, & Ahnberg, 1998; Osman et al., 1997). Test-retest reliability ranging from 1-12 days was found to be 0.96 (Sprinkle et al., 2002). Convergent validity has been supported, as the BDI-II is significantly positively correlated with other measures of depression and anxiety, such as the Mood and Anxiety Symptom Questionnaire and the Depression Anxiety Stress Scales (Osman et al., 1997). Moreover, stronger correlations between the BDI-II and measures of depression rather than anxiety supported construct validity (Osman et al., 1997). Finally, discriminant validity was indicated by a low and nonsignificant correlation between the BDI-II and the Marlowe-Crowne Social Desirability Scale (Osman et al., 1997).

***Binge Scale (BS)***. The BS is a 9-item self-report measure that assessed feelings and behaviours characteristic of binge eating (Hawkins & Clement, 1980). Responses were presented in multiple-choice format, with three or four choices per item. Each response was scored from 0-3 or 0-2, and a total score was obtained by summing all items. Higher scores were indicative of more binge eating symptomatology.

In a validation study, the internal consistency (Cronbach's alpha) of the BS was 0.68, while the one-month test-retest reliability was 0.88 (Hawkins & Clement, 1980).

Concurrent validity was supported by the finding that overweight individuals and those with body image concerns obtained higher scores than did normal-weight individuals and those without body image concerns. Finally, both convergent and divergent validity was demonstrated, as the BS was significantly correlated with another measure of disordered eating (the Restraint Scale) but not a measure of social desirability (the Social Desirability Scale).

***Demographic Questionnaire (DQ)***. This questionnaire was used to obtain demographic-related information from participants, such as ethnicity and educational background (see Appendix I). One item also inquired about participants' own classification of their weight status.

***Hunger Ratings***. This Visual Analogue Scale was taken from Bell, Roeb, and Rolls (2003), and measured participants' current hunger, thirst, and fullness. Participants made their ratings by placing a mark on a 10 centimetre line, anchored on the ends by "not at all" and "extremely". A composite hunger score was obtained by calculating the mean of the three items (fullness was reverse coded).

***Positive and Negative Affect Schedule–Expanded Form (PANAS-X)***. The PANAS-X is a 60-item self-report measure that assessed levels of general positive and negative affect, as well as specific emotions (Watson & Clark, 1994). Sixty affective states were presented, and participants indicated on a scale from 1 ("very slightly or not at all") to 5 ("extremely") the extent to which they felt each emotion at the moment (i.e., the "state" instructions). Two general subscales were yielded (Positive Affect and Negative Affect), as well as 11 subscales of specific states (e.g., Guilt, Sadness). The subscales

were calculated by summing their respective items, with higher scores indicative of greater levels of that state. Four subscales (Attentiveness, Fatigue, Shyness, and Surprise) were not used because they did not reflect specific negative or positive emotions.

For the Positive and Negative Affect general subscales, Watson and Clark (1994) reported that the Cronbach's alphas ranged from 0.83 to 0.88 and 0.85 to 0.91 respectively for the state instructions. Convergent validity was demonstrated, as self-rated scores were significantly correlated with the ratings of peers and partners ( $r$ s ranged from 0.21 to 0.48). For the 11 subscales, the Cronbach's alphas ranged from 0.72 to 0.93 for the state instructions. Convergent validity was demonstrated, as these subscales were significantly correlated with corresponding subscales of the Profile of Mood States scale, as well as with peer ratings.

***Revised Restraint Scale (RRS)***. The RRS is a 10-item self-report measure that assessed both restrained eating and weight fluctuations (Herman & Polivy, 1980). These two patterns are characteristic of unsuccessful chronic dieters (Heatherton, Herman, Polivy, King, & McGree, 1988; Laessle, Tuschl, Kotthaus, & Prike, 1989). Four or five response options were presented for each item, with respondents choosing the most applicable option. The RRS was scored by calculating the sum of 10 questions, excluding numbers 10 (reported maximum weight) and 12 (behaviours following dietary disinhibition). Higher scores were indicative of greater cognitive restraint, or the intention to restrict food intake.

In nonobese samples, the internal consistency of the RRS has been reported to



range from 0.78 (Laessle et al., 1989) to 0.86 (Ruderman, 1983). Test-retest reliability has been reported to range from 0.74 at two and a half years (Klesges, Klem, Ekins, & Klesges, 1991) to 0.95 at two weeks (Allison, Kalinsky, & Gorman, 1992). Convergent validity has been demonstrated, as the RRS correlates highly with other measures of restrained eating, such as the Dutch Eating Behaviour Questionnaire and the Three-Factor Eating Questionnaire (Allison et al., 1992). In obese samples, the internal consistency of the RRS ranges from 0.51 (Ruderman, 1983) to 0.72 (Allison et al., 1992).

***Rosenberg Self-Esteem Scale (RSES).*** The RSES is a 10-item self-report measure that assessed global trait self-esteem (Rosenberg, 1979). Level of agreement with each item was recorded from 0 (“strongly disagree”) to 3 (“strongly agree”). A total score was obtained by summing all items, and higher scores were indicative of higher self-esteem.

The RSES has been found to have high internal consistency (Cronbach’s alpha = 0.92; Rosenberg, 1979). Test-retest reliability has been found to range from a mean of 0.69 at six years (Robins, Hendin, & Trzesniewski, 2001) to 0.85 at two weeks (Silber & Tippett, 1965). Construct validity has been demonstrated, such that individuals scoring high on this measure report few symptoms of depression and anxiety (Rosenberg, 1979). Finally, the RSES has been reported to have good convergent validity, correlating with other measures of self-esteem such as the Coopersmith Self-Esteem Inventory (Demo, 1985).

***State Self-Esteem Scale (SSES).*** The SSES is a 20-item self-report measure that assessed temporary changes in self-esteem (Heatherton & Polivy, 1991). Regardless of trait self-esteem, temporary fluctuations can occur in response to affectively laden events

(Heatherton & Wyland, 2003), such as the experience of stigmatization.

The SSES consisted of three subscales: Performance, Social, and Appearance self-esteem. Performance self-esteem assessed confidence in one's general competence and abilities, social self-esteem assessed the perception that one is positively viewed and accepted by others, and appearance self-esteem assessed confidence in physical appearance (Heatherton & Wyland, 2003). Respondents rated their agreement with each item from 1 ("not at all") to 5 ("extremely"), and were instructed to base their responses on current thoughts and feelings. Scores were calculated by summing the items that constitute each subscale, with higher scores indicative of higher self-esteem.

In a series of validation studies, Heatherton and Polivy (1991) reported that the SSES had high internal consistency (Cronbach's  $\alpha = 0.92$ ). The test-retest reliability of this measure ranged from 0.48 to 0.75, although these low reliabilities are expected given that the SSES assesses temporary fluctuations in self-esteem, and should therefore not be expected to be temporally stable. The three subscales had good discriminant validity; for example, Appearance self-esteem was the subscale most highly correlated with dietary restraint. Finally, convergent validity was demonstrated, as the subscales correlated highly with other measures of trait self-esteem, such as the Janis and Field Self-Esteem Scale.

***Stereotype Threat Assessment (STA)***. A four-item self-report questionnaire (Appendix F) was constructed for this study to assess the extent to which participants experienced stereotype threat during the taste test. Responses were recorded on an 8-point Likert scale. The items were based on the ones used by Steele and Aronson (1995),

and Schmader and Johns (2003). Two items focussed on the experience of threat to the self (i.e., the concern that one's consumption would be judged), while two items focussed on threat to one's group (i.e., the concern that individuals of a similar weight would be judged based on the self's consumption). A total score was obtained by summing all items, with higher scores indicative of greater subjective feelings of stereotype threat.

***Vignette Comprehension Questions.*** To ensure that participants read and understood the vignettes, four comprehension questions immediately followed each vignette. These questions, presented in Appendices G-K, were either in true-false or multiple-choice format.

***Candy Taste Test Rating Form.*** This form was taken from Aubie and Jarry (2009), and instructed participants to rate each candy on a number of different dimensions (e.g., texture, flavour).

**Procedure.** Both Studies 1 and 2 followed Tri-council ethical guidelines and were approved by the Review of Ethics Board of the University of Windsor (REB #08-194). There were two methods of recruitment. Firstly, given the anticipated difficulty in recruiting overweight and obese participants due to low prevalence in an undergraduate population (Hlaing et al., 2007; Lowry et al., 2000), an optional question about participants' weight and height was included in the participant pool screening items, and eligible females whose estimated weight and height yielded a BMI of above 25 were randomly selected and sent an email invitation to participate in the study. To avoid sampling bias, an approximately equal number of participants with an estimated BMI below 25, as well as participants who declined to provide their weight and height data,

were also randomly selected and invited to participate. Secondly, participants could self-register for the study by selecting from pre-determined timeslots posted on the participant pool website. Only participants who had met the three selection criteria described above were contacted or could view the experiment. All participants received 1.5 bonus points for a psychology course of their choice (as long as the course provided such an option) in return for their participation.

A cover story was used to advertise the study, to conceal its true purpose. Specifically, the ostensible purpose was to investigate the effectiveness of a “new” memory distractor task. The rationale stated that traditional memory studies present individuals with some information to recall, and then have them engage in an unrelated task to prevent rehearsal in the period between presentation and recall. Most studies in the literature have supposedly employed cognitive distractor tasks; however, the advertised study would test a “new” distractor task that was based on the sensory experiences of taste and smell. Specifically, it would entail tasting and rating different types of chocolate candy. Further, the questionnaires on mood and eating habits were presented as necessary to investigate individual differences in response to the distractor task, which would help determine the effectiveness of the task in inhibiting memory rehearsal.

In accordance with Aubie and Jarry (2009), all participants were tested individually between the hours of 11am-6pm, and were instructed to eat a small to moderate amount of food 1-3 hours prior to the experiment, in an attempt to equalize hunger between participants. The experimenter (also the first author) was blind to the

experimental condition of each participant in the following manner. All questionnaire packages were prepared beforehand by the experimenter. However, there was no indication of condition on any of the materials. Moreover, the vignettes were prefaced by a cover page so that their content was not visible.

Upon arrival to the laboratory, participants first read and signed a consent form (Appendix L), and received a letter of information (Appendix M) for their own records. They were then reminded of the ostensible purpose and procedures of the study. Concerning the procedures, they were told that they would firstly complete two mood questionnaires. Secondly, they would read four paragraphs, all related to the theme of social issues in transportation, and their memory for the information in these paragraphs would be subsequently tested in a recall test. Thirdly, as the “new” memory distractor task, they would engage in a taste test of three different types of chocolate candy, and complete ratings on each one. Fourthly, they would complete questionnaires on their mood and eating habits. They were informed that the recall test would be administered at the end. Throughout the experiment, participants were presented with task materials and instructions, after which they were left alone to complete the task.

Following this explanation, participants completed the Rosenberg Self-Esteem Scale and the Beck Depression Inventory-II. Then, they were presented with a booklet containing the four vignettes and their respective comprehension questions. In the stereotype threat condition, the critical vignette was ordered third, so as to ensure its temporal proximity to the eating task without being conspicuous. The order of the remaining vignettes was determined randomly for each participant. In the control

condition, the order of all vignettes was randomly determined. Participants were instructed to read a vignette and to then immediately complete the associated comprehension questions. They were informed that they would have 10 minutes to complete this task, and that they could check over their answers if they finished before 10 minutes had elapsed.

The taste-test distractor task then followed. The experimenter entered the room with a tray containing the three bowls of candies that had been pre-weighed and pre-counted, a glass of water, and the candy taste test rating forms. The taste-test instructions closely followed those of Aubie and Jarry (2009). Firstly, participants were told to complete the Hunger Ratings as soon as the experimenter had left the room. Then, they were instructed to “begin by taking a sip of water to cleanse their palate” (Aubie & Jarry, 2009, p. 916), before beginning to taste candy A. They were told to eat as many of candy A as they needed to complete the rating form. Once they were satisfied with their candy A ratings, they should take another sip of water to remove the taste of this candy from their palate, and then move onto candy B. Participants were told to taste and rate candy B in the same manner, with the addition that they could not re-taste or change their ratings of candy A. After candy B, participants were told to take another sip of water, and then to complete the same procedure for candy C without re-tasting or altering their ratings of the previous candies. Participants were given 10 minutes to perform the taste-test, and were informed that if they completed the ratings before 10 minutes had passed, they were welcome to help themselves to as many of the candies as they wanted because any leftovers would be discarded.

Following the eating task, the eating and mood questionnaires were presented.

All questionnaires—Appearance Schemas Inventory-Revised, Binge Scale, Demographic Questionnaire, Positive and Negative Affect Schedule-Expanded Form, Revised Restraint Scale, and State Self-Esteem Scale—were presented in random order. To facilitate eating, the candies were left in the room for an additional 10 minutes, and participants were again reminded to help themselves if they chose to do so. To standardize the 10 minutes for all participants, they were informed that the experimenter had to leave for approximately 10 minutes to run an errand, but would check in on their progress upon returning. Therefore, should they complete the questionnaires before the experimenter's return, they should check their questionnaires for items missed. After 10 minutes, the experimenter returned and collected the bowls of candies. Participants who had not completed the questionnaires were asked to ring a bell when they had finished. Each bowl of candy was weighed and counted again.

Following the completion of the questionnaires, the recall test was administered in a free-response format. Participants were instructed to write down all the details they could remember from each vignette. They were told to write down at least one idea per vignette if possible. However, the vignettes did not have to be recalled by order of presentation, and the amount they wrote could differ for each. Responses could also be in point form. They were given 10 minutes to complete this task.

Finally, participants completed the Stereotype Threat Assessment, after which they were debriefed and the true purpose of the study was explained (Appendix N). They were given the option of removing their data from the study (none did). Participants who consented to having their data remain signed a final consent form (Appendix O) indicating their consent and their understanding of the true purpose of the study. Then,

they completed the State Self-Esteem Scale and the Positive and Negative Affect Schedule–Expanded Form again. Finally, participants were asked their consent to have their height and weight measured to calculate their BMI. Those who agreed signed an additional consent form detailing this procedure (Appendix P).

**Analytical strategy.** Table 3 outlines the analyses that were used in Study 1. All analyses were performed in Statistics Package for the Social Sciences for Windows (SPSS), Version 18.0. Missing data was replaced with mean imputation (i.e., substituting the mean of a participant’s score on a measure or subscale). Four datum were missing: one BDI-II item (an intended covariate) for two participants, one Binge Scale item (also a covariate) for one participant, and one item from the PANAS-X Joviality subscale (a dependent variable) for one participant. In addition, outliers for each dependent variable were identified and Winsorised, since outliers can bias the data (Field, 2009). Data is presented for the Winsorised variables when this procedure had been performed (Howell, 2002). However, further transformations were not performed because ANOVA is robust to non-normality (Howell, 2002).

**Planned analyses.** A 2 (stereotype threat) x 2 (weight category) x 2 (appearance investment category) factorial design was employed. Weight status was defined both objectively (using weight and height measurements to calculate BMI) and subjectively (using participants’ self-categorizations). All analyses were performed twice, using each method of weight definition.



Table 3

*Hypotheses and Analytical Strategy for Study 1*

Hypotheses	Dependent Variable	Analyses
Threatened overweight participants would eat significantly more than would unthreatened participants, and normal-weight participants in either condition. The eating of the latter three groups was not expected to differ.	Number of candies eaten	<ol style="list-style-type: none"> <li>1. 2 (stereotype threat) x 2 (objective/subjective weight) x 2 (investment) between-subjects ANOVA</li> <li>2. Planned comparisons:               <ol style="list-style-type: none"> <li>a. Compared the eating of threatened overweight participants with the other 3 groups (one-tailed tests)</li> <li>b. Compared the eating of the other 3 groups with each other (two-tailed tests)</li> </ol> </li> </ol>
Highly invested overweight participants in the stereotype threat condition would eat more than would: (a) highly invested overweight participants in the control condition, (b) lowly invested overweight participants in either condition, and (c) normal-weight participants in either condition, regardless of appearance investment. The eating of the other seven groups was not expected to differ.		<ol style="list-style-type: none"> <li>1. 2 (stereotype threat) x 2 (objective/subjective weight) x 2 (investment) between-subjects ANOVA</li> <li>2. Planned comparisons:               <ol style="list-style-type: none"> <li>a. Compared the eating of highly invested overweight participants in the threat condition with the other 7 groups (one-tailed tests)</li> <li>b. Compared the eating of the other 7 groups with each other (two-tailed tests)</li> </ol> </li> </ol>

Hypotheses	Dependent Variable	Analyses
None	State mood: PANAS-X -Negative Affect -Positive Affect -Assuredness -Fear -Guilt -Hostility -Joviality -Sadness -Serenity	-2 (stereotype threat) x 2 (objective/subjective weight) x 2 (investment) between-subjects ANOVA -Simple effects analyses only if interaction terms were significant
	State self-esteem: SSES -Performance -Appearance -Social	
	Feelings of stereotype threat: STA	

*Note.* PANAS-X = Positive and Negative Affect Schedule–Expanded Form; SSES = State Self-Esteem Scale; STA = Stereotype Threat Assessment.

Because there were a priori hypotheses for eating regarding the two-way interaction between threat condition and weight, and the three-way interaction between threat condition, weight, and appearance investment, planned comparisons were conducted for this variable regardless of the significance of the interaction effects (Howell, 2002; Rosnow & Rosenthal, 1988). However, because no a priori hypotheses were proposed for state mood, self-esteem, and subjective feelings of threat, post-hoc analyses involving simple effects analyses (Field, 2009) were conducted only if the omnibus interaction terms were significant.

***Dependent variables.*** Following Aubie and Jarry (2009), the eating dependent variable was the number of candies eaten rather than weight, as the different candies had different individual weights. State mood (PANAS-X) and self-esteem (SSES), as well as feelings of stereotype threat (STA), also were included as dependent variables.

***Potential covariates.*** Binge (BS) and restrained (RRS) eating tendencies, as well as the composite score of participants' hunger ratings, were examined as potential covariates in the eating analyses. Previous research has found that restrained and binge eaters tend to consume more under ego threat. For example, McFarlane, Polivy, and Herman (1998) found that when restrained eaters were falsely informed that they were five pounds heavier than they actually were (i.e., the ego threat), they ate significantly more cookies on a subsequent taste test than did restrained eaters who were falsely informed that they were five pounds lighter, or those in a control group. Similarly, Aubie and Jarry (2009) showed that binge eaters ate more after reading vignettes about weight-related teasing than did binge eaters in a control condition.

Trait self-esteem (RSES) and depression (BDI-II) were examined as potential

covariates in the state self-esteem and mood analyses. Trait self-esteem has been found to correlate highly with both state self-esteem (Heatherton & Polivy, 1991) and mood (Robins et al., 2001), and the same relationships have been found for depression (Heatherton & Polivy, 1991; Watson, Clark, & Tellegen, 1988).

However, most of the covariates (BS, RRS, RSES, BDI-II) did not meet the Analysis of Covariance (ANCOVA) assumption of independence between the covariate and the independent variables (Field, 2009). Specifically, Field noted that the experimental groups should not significantly differ on the covariate. However, both objectively and subjectively overweight participants, as well as highly invested participants, had higher scores on the RRS and the BS than did normal-weight and less invested participants respectively (all  $ps < 0.03$ ). Moreover, highly invested participants had lower RSES and higher BDI-II scores than did less invested participants (all  $ps < 0.005$ ). In addition, subjectively overweight participants endorsed higher BDI-II scores than did normal-weight participants ( $p = 0.01$ ). Moreover, for the hunger covariate, the ANCOVA assumption of linearity between the dependent variable (number of candies eaten) and the covariate was not met. Given that ANCOVA assumptions had not been met, all Study 1 analyses thus employed ANOVA.

## Results

**Reliability analyses.** Prior to further analyses, the internal consistency for all measures was calculated with Cronbach's alpha coefficients. These are displayed in Table 4, along with descriptive data for all variables. The reliability analyses revealed coefficients ranging from 0.68 to 0.92. Although it has been recommended that research

Table 4

*Study 1: Descriptive Data and Internal Consistency for Measures and Eating (N = 150)*

Variable	Range	Mean	Standard Deviation	Cronbach's Alpha
Total number of candies eaten	3.00-203.00	57.19	36.46	
Appearance Schemas Inventory-Revised	1.65 - 4.70	3.23	0.57	0.87
Beck Depression Inventory-II	0.00-31.00	9.27	6.71	0.88
Binge Scale	0.00-14.00	2.89	3.47	0.74
Restraint Scale	1.00-30.00	14.02	5.98	0.78
Rosenberg Self-Esteem Scale	11.00-30.00	23.32	4.27	0.84
PANAS–Expanded Form				
Negative Affect	10.00-34.00	13.07	4.32	0.87
Positive Affect	11.00-45.00	27.47	7.2	0.86
Assuredness	6.00-28.00	14.34	4.79	0.84
Fear	6.00-20.00	7.74	2.56	0.8
Guilt	6.00-24.00	7.48	2.83	0.89
Hostility	6.00-19.00	7.13	2.21	0.84
Joviality	8.00-40.00	21.39	6.9	0.92
Sadness	5.00-15.00	7.1	2.54	0.68
Serenity	4.00-15.00	10.68	2.34	0.76
State Self-Esteem Scale				
Appearance	6.00-29.00	19.51	4.76	0.85
Performance	15.00-34.00	27.69	4.14	0.82
Social	12.00-35.00	27.21	5.37	0.86
Stereotype Threat Assessment	4.00-25.00	9.39	5.18	0.81

*Note.* PANAS = Positive and Negative Affect Schedule.

employ measures with a reliability above 0.70 (Nunnally & Bernstein, 1994), the PANAS-X Sadness subscale failed to reach this level (Cronbach's alpha = 0.68), which may have been due to its brief length (Briggs & Cheek, 1986; Watson & Clark, 1994). Therefore, although this subscale was still used, the results it yielded were interpreted with caution.

### **Objective weight analyses.**

*Assumptions of ANOVA.* The assumptions of ANOVA were checked prior to conducting further analyses. The normality assumption was assessed for all dependent variables with standardized skewness and kurtosis scores, and Kolmogorov-Smirnov statistics. The Kolmogorov-Smirnov test was significant for all dependent variables ( $ps < 0.04$ ) except for PANAS-X Positive Affect, indicating that these distributions deviated from normality. Number of candies eaten, Stereotype Threat Assessment, and all non-normally distributed PANAS-X subscales were significantly positively skewed, except for Serenity, which was negatively skewed. All non-normally distributed SSES subscales were significantly negatively skewed, except for Appearance Self-Esteem, which was not significantly skewed. In addition, the following variables demonstrated significant positive kurtosis: number of candies eaten, Stereotype Threat Assessment, SSES Academic Self-Esteem, and PANAS-X Negative Affect, Fear, Hostility, Guilt, and Sadness. Dependent variables that demonstrated significant skewness and kurtosis were not transformed on this basis because ANOVA is generally robust to non-normality (Howell, 2002).

Homogeneity of variance was assessed with Levene's test, and by comparing the

smallest and largest variances of each ANOVA cell, to ensure that the latter is not four times the former (Howell, 2002). Levene's test was significant for Stereotype Threat Assessment, and the PANAS-X Fear, Hostility, and Guilt scales ( $ps < 0.05$ ), indicating heterogenous variance. Moreover, for all these PANAS-X scales, the largest variances were greater than four times the smallest variances. Howell recommends alternative procedures such as data transformations when heterogeneous variances are present along with unequal sample sizes; further, he notes that logarithmic transformations are appropriate for data that is positively skewed. Therefore, these PANAS-X subscales were logarithmically transformed and were used for all ANOVAs in the objective weight analyses, although the means of the untransformed data will be reported for ease of interpretation (Howell, 2002).

***Vignette comprehension.*** To ensure that all participants had read and understood the four vignettes, four comprehension questions immediately followed each vignette. Overall, the mean accuracy (number correct/number attempted) of responses to these 16 questions was 96.94%. There were no significant main effects, or interactions between threat condition, weight, and appearance investment (all  $ps > 0.06$ ).

***Main analyses.*** Means and standard deviations as a function of threat condition, objective weight, and appearance investment are displayed in Table 5, and therefore will not be displayed in the text when discussing significant three-way interactions.

***Number of candies eaten.*** None of the main or interaction effects of the three-way ANOVA were significant for number of candies eaten (all  $ps > 0.07$ ). However, given

Table 5

*Study 1: Means and Standard Deviations of Dependent Measures as Function of Threat Condition, Objective Weight Status, and Appearance Investment*

Variable	Stereotype Threat				Control			
	Overweight		Normal-weight		Overweight		Normal-Weight	
	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.
<i>n</i> *	17	17	18	25	15	17	20	18
Candies eaten	64.59 (31.77) <sup>e</sup>	61.00 (42.65) <sup>f</sup>	51.50 (36.18)	66.12 (31.34) <sup>ag</sup>	55.13 (50.22)	42.47 (25.88) <sup>bdf</sup>	58.25 (34.72)	45.61 (29.26) <sup>dh</sup>
PANAS-X								
Negative affect	12.24 (2.80)	13.65 (3.87)	12.33 (2.40)	13.32 (3.70)	12.60 (5.83)	14.47 (6.55)	11.30 (1.89)	14.17 (5.17)
Positive affect	30.35 (5.68)	25.35 (9.12)	28.50 (6.14)	27.52 (8.00)	27.00 (7.58)	27.35 (6.80)	28.80 (6.89)	25.50 (6.80)
Assuredness	15.88 (4.09)	13.70 (6.42)	14.83 (4.46)	14.28 (4.25)	14.07 (5.38)	14.18 (5.13)	15.05 (4.88)	12.72 (4.28)
Fear	7.35 (1.66)	7.88 (2.42)	7.83 (2.18)	7.52 (1.58)	7.13 (2.00)	8.41 (4.06)	6.90 (1.80)	8.56 (3.26)
Guilt	6.76 (1.64)	8.24 (2.05)	6.44 (0.86)	7.32 (2.19)	7.60 (3.42)	8.88 (4.73)	6.35 (0.81)	7.83 (3.59)
Hostility	6.47 (0.80)	7.29 (1.93)	6.67 (1.08)	7.56 (3.14)	7.27 (2.63)	7.59 (2.85)	6.40 (0.68)	7.11 (1.41)
Joviality	21.97 (5.98)	20.00 (7.73)	22.00 (4.97)	21.84 (8.33)	21.47 (6.77)	20.47 (6.73)	23.65 (6.80)	19.29 (7.25)
Sadness	6.94 (1.82)	7.65 (2.50)	6.17 (1.54)	7.88 (2.59)	6.27 (2.63)	7.53 (3.18)	6.35 (1.78)	7.11 (3.16)
Serenity	11.47 (1.97)	10.82 (2.62)	10.28 (2.24)	10.88 (2.24)	10.67 (2.64)	10.35 (2.67)	11.20 (1.99)	9.94 (2.55)



Variable	Stereotype Threat				Control			
	Overweight		Normal-weight		Overweight		Normal-Weight	
	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.
SSES								
Performance	28.65 (3.20)	25.65 (4.76)	29.33 (3.83)	27.72 (4.15)	28.40 (3.87)	25.82 (6.01)	29.30 (3.94)	26.44 (3.87)
Appearance	19.35 (5.04)	16.53 (4.05)	22.00 (3.46)	20.88 (4.34)	18.67 (3.88)	15.06 (4.51)	23.30 (2.64)	19.67 (4.24)
Social	29.06 (3.70)	23.29 (6.59)	31.33 (3.05)	26.44 (5.09)	28.07 (4.99)	24.12 (6.04)	30.15 (3.72)	25.72 (4.47)
STA	8.59 (4.36)	9.35 (6.61)	8.83 (4.12)	7.78 (4.50)	10.87 (6.49)	11.41 (6.34)	7.90 (3.42)	10.72 (4.97)

*Note.* Invest. = investment; PANAS-X = Positive and Negative Affect Schedule–Expanded Form; SSES = State Self-Esteem Scale; STA = Stereotype Threat Assessment.

\*In these and subsequent analyses, cell sizes were unequal. However, the method used by SPSS to calculate ANOVA sums of squares (Type III) is impervious to unequal cell sizes (Field, 2009), and therefore, no adjustments to the ANOVAs were deemed necessary.

a-b. Significantly different at the 0.05 level.

c-d, e-f, g-h. Pairs significantly different at the 0.10 level.

that hypotheses were formulate a priori, planned comparisons were conducted to test these hypotheses. In these analyses, one-tailed tests were used when predictions involved one group being expected to eat more than the other groups, while predictions involving no differences in eating were analysed with two-tailed tests.

A two-way interaction had been predicted, such that objectively overweight participants in the threat condition would eat significantly more candies than would overweight participants in the control condition, and normal-weight participants in either condition. The latter three groups' eating was not expected to significantly differ. Planned comparisons indicated that overweight participants in the threat condition ( $M = 62.79$ ,  $SD = 37.08$ ) ate significantly more candies than did overweight participants in the control condition ( $M = 48.41$ ,  $SD = 39.06$ ),  $t(143) = 1.65$ ,  $p = 0.05$ , Cohen's  $d = 0.38$ . Contrary to hypotheses however, threatened overweight participants did not eat significantly more than did normal-weight participants in either condition (all  $ps > 0.10$ ). Finally, as predicted, the eating of unthreatened overweight participants, and normal-weight participants in either condition, did not significantly differ (all  $ps > 0.16$ ). See Figure 1 for a graphical representation of these results.

A three-way interaction also had been predicted, such that threatened and highly invested overweight participants would eat more than would: (a) unthreatened and highly invested overweight participants, (b) overweight participants low in appearance investment in either condition, and (c) normal-weight participants regardless of condition or investment. The latter groups' eating were not expected to significantly differ.

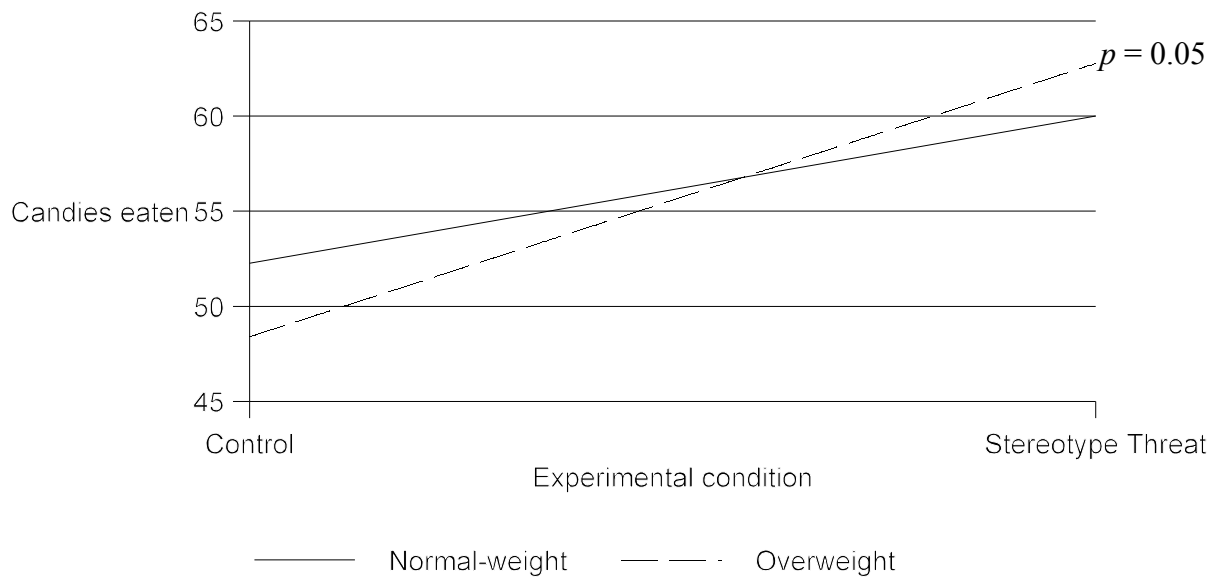


Figure 1. Number of candies eaten as a function of experimental condition and objective weight.

Contrary to hypotheses, planned comparisons found that threatened and highly invested overweight participants did not eat more candies than did any other group (all  $ps > 0.06$ ). As expected, none of the other groups differed in eating (all  $ps > 0.07$ ), save for one exception that is noted in Table 5.

*State mood.* Because no a priori hypotheses had been formulated for the remaining dependent variables (state mood, state self-esteem, and feelings of stereotype threat), simple effects analyses using two-tailed tests were conducted following the ANOVA only if the interaction terms were significant. Table 6 displays the means and standard deviations of these dependent variables stratified by the three independent variables of interest (objective weight, experimental condition, and investment category). Significant main effects also are noted in this table, and thus this statistical information will not be repeated in-text.

The ANOVA revealed significant main effects of appearance investment for Negative Affect, Hostility, Guilt, and Sadness. Participants high in investment reported higher scores than did participants low in investment. For Guilt, there was also a significant main effect of weight, with overweight participants reporting more guilt than did normal-weight participants.

*State self-esteem.* The ANOVA revealed significant main effects of investment for Performance, Appearance, and Social self-esteem. Highly invested participants reported lower self-esteem than did less invested participants in all three domains. In addition, overweight participants endorsed lower Appearance and Social self-esteem than did normal-weight participants.

Table 6

*Study 1: State Mood, State Self-Esteem, and Feelings of Stereotype Threat Stratified by Threat Condition, Objective Weight, and Appearance Investment*

Variable	Threat Condition		Objective Weight		Appearance Investment	
	Control	Threat	Normal-weight	Overweight	Low invest.	High invest.
<b>PANAS-X</b>						
Negative Affect	13.08 (5.12)	12.92 (3.28)	12.79 (3.60)	13.26 (4.93)	12.07 (3.37) <sup>a</sup>	13.84 (4.76) <sup>b</sup>
Positive Affect	27.21 (6.96)	27.90 (7.47)	27.60 (7.06)	27.53 (7.45)	28.71 (6.54) <sup>c</sup>	26.53 (7.67) <sup>d</sup>
Assuredness	14.03 (4.88)	14.64 (4.79)	14.25 (4.47)	14.47 (5.26)	14.99 (4.65)	13.77 (4.94)
Fear	7.74 (2.95)	7.64 (1.92)	7.67 (2.26)	7.71 (2.70)	7.30 (1.91) <sup>c</sup>	8.04 (2.84) <sup>d</sup>
Guilt	7.61 (3.43)	7.19 (1.88)	7.00 (2.20) <sup>a</sup>	7.88 (3.22) <sup>b</sup>	6.74 (1.89) <sup>a</sup>	7.99 (3.21) <sup>b</sup>
Hostility	7.06 (2.03)	7.05 (2.12)	6.98 (1.99)	7.15 (2.18)	6.67 (1.44) <sup>a</sup>	7.40 (2.47) <sup>b</sup>
Joviality	21.28 (6.95)	21.50 (6.94)	21.75 (7.11)	20.96 (6.72)	22.35 (6.09)	20.53 (7.54)
Sadness	6.81 (2.71)	7.22 (2.26)	6.95 (2.43)	7.12 (2.58)	6.43 (1.93) <sup>a</sup>	7.57 (2.81) <sup>b</sup>
Serenity	10.56 (2.45)	10.86 (2.27)	10.62 (2.27)	10.83 (2.47)	10.91 (2.20)	10.53 (2.48)
<b>State Self-Esteem Scale</b>						
Appearance	19.37 (4.83)	19.84 (4.62)	21.46 (3.93) <sup>a</sup>	17.36 (4.64) <sup>b</sup>	21.01 (4.18) <sup>a</sup>	18.35 (4.84) <sup>b</sup>
Performance	27.53 (4.63)	27.84 (4.17)	28.18 (4.06)	27.09 (4.71)	28.96 (3.67) <sup>a</sup>	26.54 (4.68) <sup>b</sup>
Social	27.10 (5.28)	27.47 (5.54)	28.28 (4.77) <sup>a</sup>	26.08 (5.89) <sup>b</sup>	29.74 (3.97) <sup>a</sup>	25.06 (5.58) <sup>b</sup>
STA	10.11 (5.41) <sup>c</sup>	8.55 (4.87) <sup>d</sup>	8.70 (4.36)	10.03 (5.98)	8.94 (4.64)	9.62 (5.63)

*Note.* Invest. = investment; PANAS-X = Positive and Negative Affect Schedule–Expanded Form; STA = Stereotype Threat Assessment.

a-b. Significantly different at the 0.05 level in comparisons within each independent variable category.

c-d. Significantly different at the 0.10 level in comparisons within each independent variable category.

*Feelings of stereotype threat.* None of the ANOVA's main or interaction effects were significant for this variable (all  $ps > 0.06$ ).

*Summary of objective weight results.* Table 7 summarizes the results of the objective weight analyses. The hypothesized two-way interaction between weight and stereotype threat was partially supported, as threatened overweight participants ate more candies than did one other group—unthreatened overweight participants. In addition, generally, both highly invested and overweight participants reported worse state affect and self-esteem than did less invested and normal-weight participants respectively.

**Subjective weight analyses.** These analyses followed the same format as the ones for objective weight, except that weight was defined using subjective criteria—participants' identification of their own weight category. Therefore, when weight descriptors were used (e.g., overweight), these referred to participants' self-ratings.

*Participant characteristics.* Seventy-one participants who were classified as objectively normal-weight based on their BMI also classified themselves in this category for the subjective weight analyses (BMI  $M = 20.84$ ,  $SD = 2.04$ ). Ten objectively normal-weight participants self-identified as overweight or obese (BMI  $M = 22.09$ ,  $SD = 2.29$ ). Fifteen objectively overweight or obese participants classified themselves as normal-weight (BMI  $M = 26.50$ ,  $SD = 1.05$ ). Fifty-one objectively overweight or obese participants self-identified with this weight group (BMI  $M = 30.81$ ,  $SD = 4.07$ ). Finally, of three participants who declined being weighed and did not provide estimations of their height and weight, two classified themselves as overweight or obese, while one self-identified as normal-weight.

Table 7

*Summary of the Objective Weight Results for Study 1*

Hypotheses	Dependent Variable	Results
Threatened overweight participants would eat significantly more than would unthreatened participants, and normal-weight participants in either condition. The eating of the latter three groups was not expected to differ.	Number of candies eaten	Hypotheses partially supported: threatened overweight participants ate significantly more than did unthreatened overweight participants.
Highly invested overweight participants in the stereotype threat condition would eat more than would: (a) highly invested overweight participants in the control condition, (b) lowly invested overweight participants in either condition, and (c) normal-weight participants in either condition, regardless of appearance investment.		Hypotheses not supported: highly invested overweight participants in the threat condition did not eat significantly more than did any other group.



Hypotheses	Dependent Variable	Results
None	State mood: PANAS-X -Negative Affect -Positive Affect -Assuredness -Fear -Guilt -Hostility -Joviality -Sadness -Serenity	-Main effect of investment: Participants high in investment reported more Negative Affect, Hostility, Guilt, and Sadness than did participants low in investment. -Main effect of weight: Overweight participants reported more Guilt than did normal-weight participants.
	State self-esteem: SSES -Performance -Appearance -Social	-Main effect of investment: Participants high in investment reported greater Performance, Appearance, and Social self-esteem than did participants low in investment. -Main effect of weight: Overweight participants reported lower Appearance and Social self-esteem than did normal-weight participants.
	Feelings of stereotype threat: STA	No significant results

*Note.* PANAS-X = Positive and Negative Affect Schedule–Expanded Form; SSES = State Self-Esteem Scale; STA =

Stereotype Threat Assessment.

**Assumptions of ANOVA.** The normality of the distribution of the dependent variables had been assessed previously. However, because the weight variable was defined differently, homogeneity of variance was checked again using Levene's test, and by comparing the smallest and largest variances of each ANOVA. Levene's test was significant for the PANAS-X Negative Affect, Fear, Hostility, Guilt, and Sadness subscales, as well as for Stereotype Threat Assessment and the SSES Social subscale (all  $ps < 0.05$ ), indicating heterogenous variance. Moreover, the largest cell variances of all PANAS-X scales, and Stereotype Threat Assessment, were greater than four times the smallest variances. In addition, these variables were positively skewed. Therefore, they were logarithmically transformed (Howell, 2002). These transformed scales were used for all subjective weight analyses, although the untransformed means will be reported for conceptual clarity.

**Vignette comprehension.** For accuracy of the vignette comprehension questions, there were no significant main effects, or interactions between threat condition, subjective weight, and appearance investment (all  $ps > 0.08$ ).

**Main analyses.** Means and standard deviations as a function of threat condition, subjective weight, and appearance investment are displayed in Table 8, and therefore will not be mentioned in the text when discussing significant three-way interactions.

**Number of candies eaten.** There was a significant main effect of stereotype threat, such that participants in the threat condition ( $M = 62.06$ ,  $SD = 35.62$ ) ate more candies than did participants in the control condition ( $M = 51.90$ ,  $SD = 36.86$ ),  $F(1, 142) = 3.80$ ,  $p = 0.05$ ,  $\eta^2 = 0.03$ .

Table 8

*Study 1: Means and Standard Deviations of Dependent Measures as Function of Threat Condition, Subjective Weight Status, and Appearance Investment*

Variable	Stereotype Threat				Control			
	Overweight		Normal-weight		Overweight		Normal-Weight	
	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.
<i>n</i>	13	17	22	26	11	22	24	15
Candies eaten	61.61 (31.48)	60.47 (35.45) <sup>e</sup>	55.64 (36.32)	68.77 (37.87) <sup>ai</sup>	39.00 (27.84) <sup>bcd</sup>	47.09 (32.50) <sup>bs</sup>	65.12 (44.43) <sup>dh</sup>	47.27 (31.96) <sup>j</sup>
PANAS-X								
Negative affect	12.00 (3.14)	12.59 (2.00)	12.45 (2.22)	14.04 (4.40)	13.54 (6.62)	15.77 (7.16)	11.08 (1.79)	12.60 (2.75)
Positive affect	27.08 (5.20)	24.53 (9.16)	30.77 (5.98)	27.73 (7.80)	27.09 (8.26)	27.23 (6.98)	28.46 (6.72)	24.87 (6.13)
Assuredness	13.92 (4.09)	13.06 (6.27)	16.18 (4.22)	14.62 (4.22)	14.45 (6.14)	14.14 (5.12)	14.71 (4.61)	12.60 (3.79)
Fear	7.31 (1.89)	7.12 (1.50)	7.77 (1.97)	7.96 (2.14)	7.64 (2.16)	9.36 (4.57)	6.71 (1.68)	7.73 (1.94)
Guilt	6.85 (1.86)	8.41 (2.21)	6.45 (0.80)	7.42 (2.28)	8.09 (3.91)	9.50 (5.16)	6.33 (0.76)	7.00 (1.56)
Hostility	6.31 (0.85)	6.88 (0.99)	6.73 (0.98)	7.88 (3.30)	7.54 (2.94)	8.04 (3.26)	6.42 (0.83)	6.87 (1.30)
Joviality	19.69 (5.78)	19.53 (8.63)	23.34 (4.79)	21.88 (7.60)	21.00 (7.82)	21.04 (6.70)	23.50 (6.26)	17.80 (6.70)
Sadness	6.77 (1.96)	7.12 (2.37)	6.41 (1.56)	8.23 (2.52)	6.45 (2.98)	8.00 (3.52)	6.25 (1.72)	6.93 (2.84)
Serenity	11.00 (2.24)	10.59 (2.40)	10.77 (2.18)	10.96 (2.37)	10.36 (2.94)	10.00 (2.65)	11.25 (1.89)	10.20 (2.43)

Variable	Stereotype Threat				Control			
	Overweight		Normal-weight		Overweight		Normal-Weight	
	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.
SSES								
Performance	29.38 (3.23)	27.00 (3.59)	28.77 (3.72)	26.81 (4.95)	26.91 (3.39)	25.59 (5.86)	29.83 (3.80)	26.53 (3.20)
Appearance	18.54 (5.35)	15.94 (4.20)	22.00 (3.31)	20.85 (4.28)	17.18 (3.09)	15.36 (4.12)	23.21 (2.62)	20.33 (4.35)
Social	29.46 (3.91)	23.53 (6.41)	30.68 (3.29)	26.19 (5.25)	27.00 (5.25)	23.41 (5.65)	30.29 (3.56)	26.87 (3.70)
STA	10.00 (5.40)	9.65 (6.51)	7.95 (3.15)	7.67 (4.45)	12.45 (6.42)	11.91 (5.93)	7.67 (3.62)	10.47 (5.05)

*Note.* Invest. = investment; PANAS-X = Positive and Negative Affect Schedule–Expanded Form; SSES = State Self-Esteem Scale; STA = Stereotype Threat Assessment.

a-b, c-d. Pairs significantly different at the 0.05 level.

e-f, g-h, i-j. Pairs significantly different at the 0.10 level.

Planned comparisons testing the hypothesized two-way interaction indicated that threatened overweight participants ( $M = 60.97$ ,  $SD = 33.22$ ) ate significantly more candies than did unthreatened overweight participants ( $M = 44.39$ ,  $SD = 30.83$ ),  $t(146) = 1.82$ ,  $p = 0.04$ , Cohen's  $d = 0.52$ . Unexpectedly, threatened normal-weight participants ( $M = 62.75$ ,  $SD = 37.37$ ) also ate more than did the latter group,  $t(146) = 2.25$ ,  $p = 0.03$ , Cohen's  $d = 0.54$ . Moreover, contrary to predictions, threatened overweight participants did not eat more than did normal-weight participants in either condition (all  $ps > 0.37$ ). See Figure 2 for a graph of these data.

Contrary to hypotheses, planned comparisons testing the hypothesized three-way interaction indicated that threatened and highly invested overweight participants did not eat more candies than did any other group (all  $ps > 0.06$ ). However, differences were found among the other groups, which are noted in Table 8.

*State mood.* Table 9 displays the means and standard deviations of the remaining dependent variables stratified by the three independent variables of interest. Significant main effects also are noted here.

The ANOVA revealed significant main effects of appearance investment for Negative Affect, Hostility, Guilt, and Sadness. Highly invested participants reported significantly greater levels of these states than did less invested participants. Moreover, there was a main effect of weight for Guilt, such that overweight participants felt guiltier than did normal-weight participants.

In addition, for Negative Affect, the two-way interaction between subjective weight and threat condition was significant,  $F(1, 142) = 6.49$ ,  $p = 0.01$ ,  $\eta^2 = 0.04$ . Simple

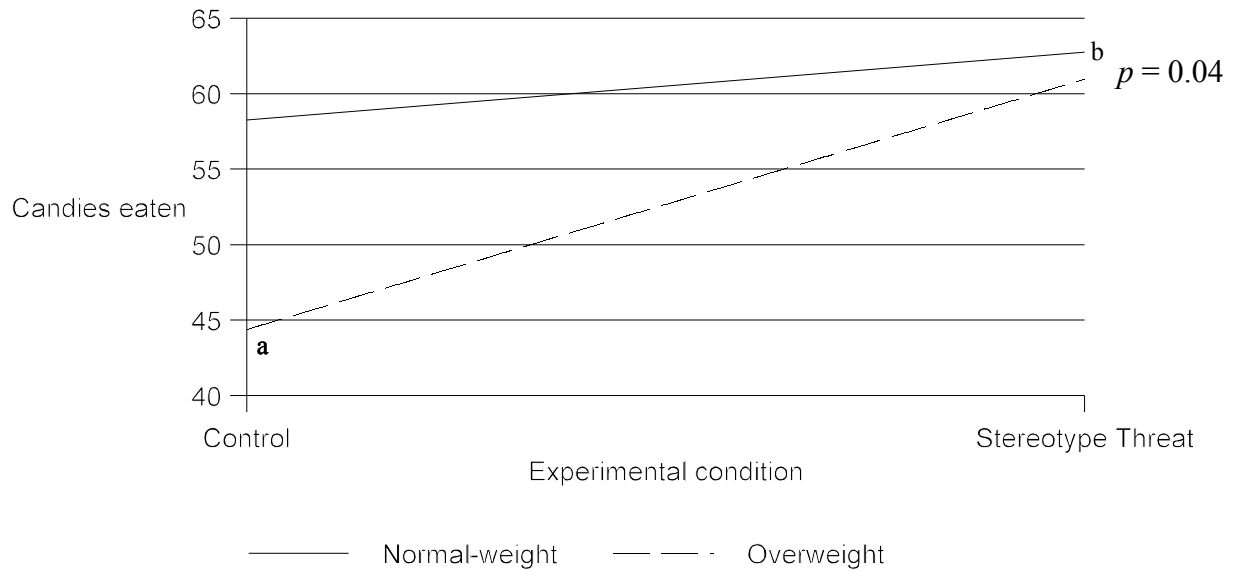


Figure 2. Number of candies eaten as a function of experimental condition and subjective weight. a-b. Significantly different at the 0.05 level.

Table 9

*Study 1: State Mood, State Self-Esteem, and Feelings of Stereotype Threat Stratified by Threat Condition, Subjective Weight, and Appearance Investment*

Variable	Threat Condition		Subjective Weight		Appearance Investment	
	Control	Threat	Normal-weight	Overweight	Low invest.	High invest.
PANAS-X						
Negative Affect	13.21 (5.25)	12.94 (3.26)	12.57 (3.19)	13.75 (5.46)	12.07 (3.37)	13.94 (4.86)
Positive Affect	27.12 (6.91)	27.78 (7.49)	28.21 (6.95)	26.44 (7.47)	28.71 (6.54) <sup>c</sup>	26.38 (7.61) <sup>d</sup>
Assuredness	14.06 (4.84)	14.60 (4.77)	14.69 (4.35)	13.86 (5.35)	14.99 (4.65)	13.78 (4.88)
Fear	7.88 (3.11)	7.62 (1.92)	7.53 (1.98)	8.03 (3.18)	7.30 (1.91)	8.12 (2.97)
Guilt	7.71 (3.53)	7.27 (1.98)	6.80 (1.56) <sup>a</sup>	8.41 (3.79) <sup>b</sup>	6.74 (1.89) <sup>a</sup>	8.12 (3.33) <sup>b</sup>
Hostility	7.18 (2.32)	7.08 (2.12)	7.01 (2.05)	7.28 (2.42)	6.67 (1.44) <sup>a</sup>	7.52 (2.66) <sup>b</sup>
Joviality	21.18 (6.91)	21.42 (6.94)	21.99 (6.66)	20.35 (7.16)	22.35 (6.09)	20.39 (7.45)
Sadness	6.96 (2.83)	7.23 (2.25)	7.00 (2.29)	7.24 (2.86)	6.43 (1.93) <sup>a</sup>	7.69 (2.86) <sup>b</sup>
Serenity	10.51 (2.43)	10.83 (2.26)	10.86 (2.20)	10.43 (2.52)	10.91 (2.20)	10.48 (2.45)
State Self-Esteem Scale						
Appearance	19.29 (4.82)	19.72 (4.73)	21.70 (3.76) <sup>a</sup>	16.49 (4.35) <sup>b</sup>	21.01 (4.18) <sup>a</sup>	18.20 (4.87) <sup>b</sup>
Performance	27.40 (4.66)	27.83 (4.14)	28.09 (4.23)	26.98 (4.55)	28.96 (3.67) <sup>a</sup>	26.46 (4.65) <sup>b</sup>
Social	26.97 (5.27)	27.42 (5.51)	28.57 (4.52) <sup>a</sup>	25.32 (5.93) <sup>b</sup>	29.74 (3.97) <sup>a</sup>	24.99 (5.50) <sup>b</sup>
STA	10.28 (5.42) <sup>a</sup>	8.57 (4.84) <sup>b</sup>	8.22 (4.11) <sup>a</sup>	11.00 (6.04) <sup>b</sup>	8.94 (4.64)	9.78 (5.62)



*Note.* Invest. = investment; PANAS-X = Positive and Negative Affect Schedule–Expanded Form; STA = Stereotype Threat Assessment.

a-b. Significantly different at the 0.05 level in comparisons within each independent variable category.

c-d. Significantly different at the 0.10 level in comparisons within each independent variable category.

effects analyses indicated that among overweight participants, those in the threat condition ( $M = 12.33$ ,  $SD = 2.52$ ) reported significantly less negative affect than did those in the control condition ( $M = 15.03$ ,  $SD = 6.97$ ),  $F(1, 147) = 4.89$ ,  $p = 0.03$ ,  $\eta^2 = 0.03$ . The opposite pattern was found in normal-weight participants, such that those in the threat condition ( $M = 13.31$ ,  $SD = 3.63$ ) reported significantly more negative affect than did those in the control condition ( $M = 11.67$ ,  $SD = 2.30$ ),  $F(1, 147) = 4.10$ ,  $p = 0.05$ ,  $\eta^2 = 0.02$ . As another way of interpreting this interaction, it was found that in the control condition, overweight participants reported significantly greater negative affect than did normal-weight participants ( $M = 11.67$ ,  $SD = 2.30$ ),  $F(1, 147) = 10.23$ ,  $p = 0.002$ ,  $\eta^2 = 0.06$ . The two groups did not significantly differ in the threat condition ( $p = 0.29$ ). See Figure 3 for a graph of these data.

For Fear, the ANOVA also revealed a significant two-way interaction of weight and threat condition,  $F(1, 142) = 5.07$ ,  $p = 0.03$ ,  $\eta^2 = 0.03$ . Analyses of simple effects revealed that overweight participants in the threat condition ( $M = 7.20$ ,  $SD = 1.65$ ) reported significantly less fear than did overweight participants in the control condition ( $M = 8.79$ ,  $SD = 3.98$ ),  $F(1, 147) = 4.99$ ,  $p = 0.02$ ,  $\eta^2 = 0.03$ . Normal-weight participants' fear did not differ by condition ( $p = 0.10$ ). To interpret this interaction alternatively, in the control condition, overweight participants reported significantly more fear than did normal-weight participants ( $M = 7.10$ ,  $SD = 1.83$ ),  $F(1, 147) = 6.65$ ,  $p = 0.01$ ,  $\eta^2 = 0.04$ . In the threat condition, the fear of the two groups did not differ ( $p = 0.21$ ). See Figure 4 for a visual representation of these findings.

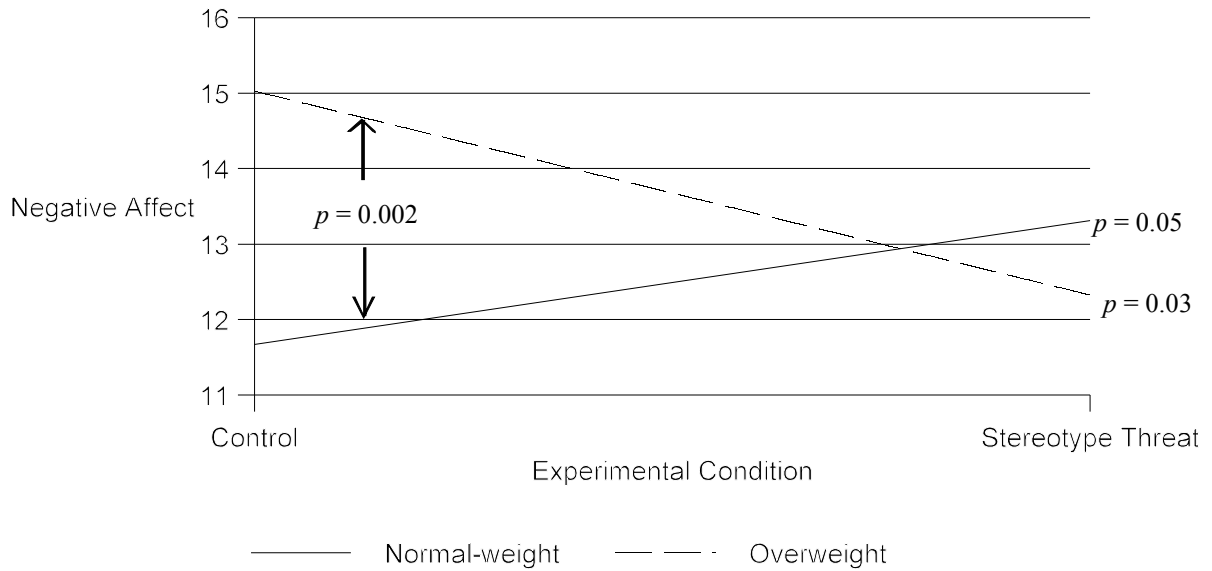


Figure 3. State negative affect as a function of experimental condition and subjective weight.

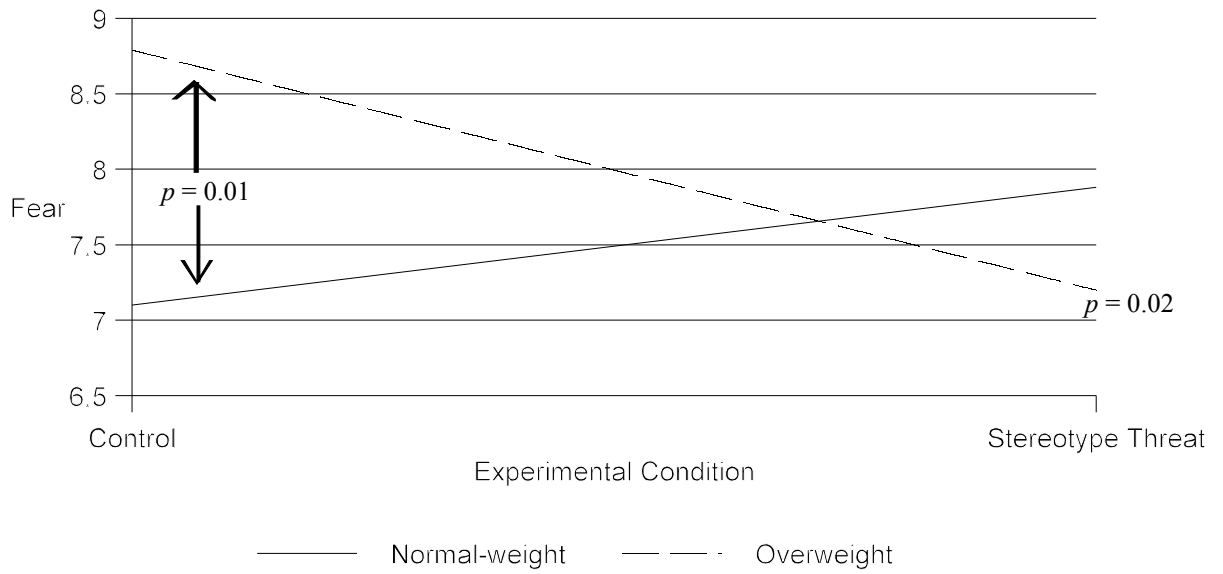


Figure 4. State fear as a function of experimental condition and subjective weight.

In addition, for Hostility, the ANOVA revealed a significant two-way interaction between weight and threat condition,  $F(1, 142) = 6.26, p = 0.01, \eta^2 = 0.04$ . Simple effects analyses revealed that among overweight participants, those in the threat condition ( $M = 6.63, SD = 0.96$ ) reported significantly less hostility than did those in the control condition ( $M = 7.88, SD = 3.12$ ),  $F(1, 147) = 5.05, p = 0.03, \eta^2 = 0.03$ . The hostility of normal-weight participants did not differ by condition ( $p = 0.11$ ). As an alternate interpretation, it was found that in the control condition, overweight participants endorsed more hostile feelings than did normal-weight participants ( $M = 6.59, SD = 1.04$ ),  $F(1, 147) = 6.16, p = 0.01, \eta^2 = 0.04$ . The hostility of the two groups did not differ in the threat condition ( $p = 0.20$ ). See Figure 5 for a graph of these data.

None of the ANOVA main or interaction effects for the other PANAS-X subscales were significant (all  $ps > 0.05$ ).

*State self-esteem.* For Performance, Appearance, and Social self-esteem, there were significant main effects of appearance investment; highly invested participants reported lower self-esteem in all three domains than did less invested participants. There were also main effects of weight for Appearance and Social self-esteem, with overweight participants reporting lower levels of self-esteem than did normal-weight participants.

*Feelings of stereotype threat.* There was a main effect of weight, such that overweight participants felt more threatened than did normal-weight participants. There was also a main effect of stereotype threat condition, with participants in the threat condition feeling less stereotype threat than did participants in the control condition.

*Summary of subjective weight results.* Table 10 summarizes the results of the subjective weight analyses. There was a significant main effect of threat condition for

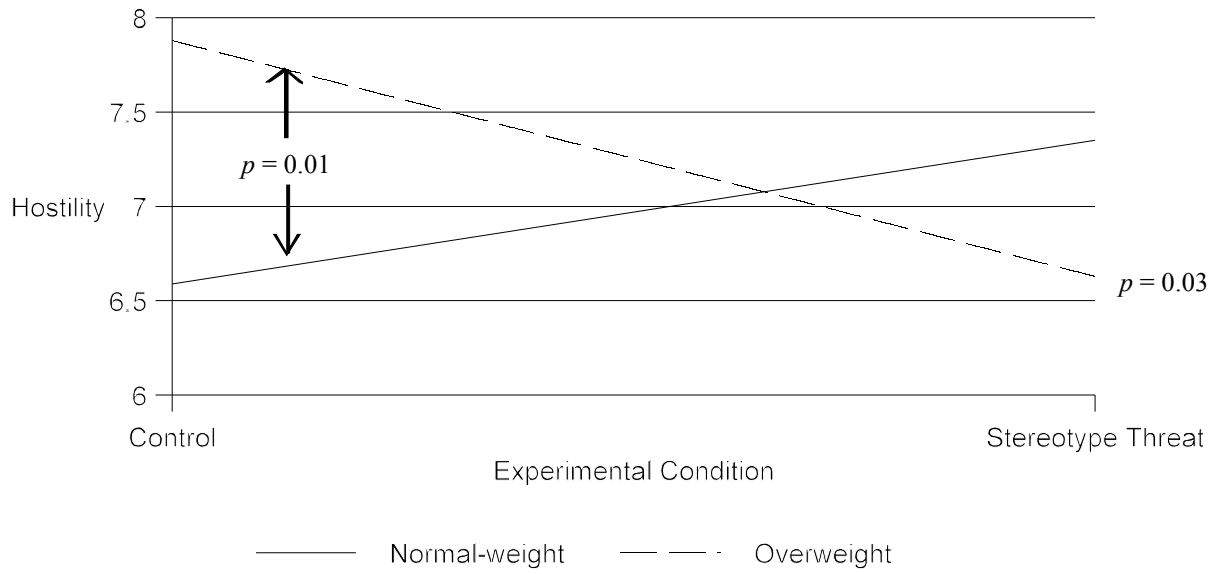


Figure 5. State hostility as a function of experimental condition and subjective weight.

Table 10

*Summary of the Subjective Weight Results for Study 1*

Hypotheses	Dependent Variable	Results
Threatened overweight participants would eat significantly more than would unthreatened participants, and normal-weight participants in either condition. The eating of the latter three groups was not expected to differ.	Number of candies eaten	Hypotheses partially supported: threatened overweight participants ate significantly more than did unthreatened overweight participants.
Highly invested overweight participants in the stereotype threat condition would eat more than would: (a) highly invested overweight participants in the control condition, (b) lowly invested overweight participants in either condition, and (c) normal-weight participants in either condition, regardless of appearance investment.		Hypotheses not supported: highly invested overweight participants in the threat condition did not eat significantly more than did any other group.
		Main effect of threat condition: threatened participants ate more than did unthreatened participants.

Hypotheses	Dependent Variable	Results
None	State mood: PANAS-X -Negative Affect -Positive Affect -Assuredness -Fear -Guilt -Hostility -Joviality -Sadness -Serenity	-Main effect of investment: highly invested participants reported more Negative Affect, Hostility, Guilt, and Sadness than did less invested participants. -Two-way interaction of weight and threat condition for Negative Affect and Hostility: among overweight participants, those in the threat condition reported less of these affective states than did those in the control condition.
	State self-esteem: SSES -Performance -Appearance -Social	-Main effect of investment: Participants high in investment reported greater Performance, Appearance, and Social self-esteem than did participants low in investment. -Main effect of weight: Overweight participants reported lower Appearance and Social self-esteem than did normal-weight participants.
	Feelings of stereotype threat: STA	-Main effect of weight: overweight participants felt more threatened than did normal-weight participants. -Main effect of threat condition: participants in the stereotype threat condition felt less threatened than did participants in the control condition.

*Note.* PANAS-X = Positive and Negative Affect Schedule–Expanded Form; SSES = State Self-Esteem Scale; STA = Stereotype Threat Assessment.



candies consumed, with threatened participants eating more candies than did unthreatened participants. However, this was qualified by the predicted two-way interaction between weight and condition, such that threatened overweight participants ate more than did unthreatened overweight participants. There were also two-way interactions between weight and condition for some mood states; in particular, among overweight participants, those in the threat condition reported less negative affect, fear, and hostility than did those in the control condition. In other words, among overweight participants, those who were threatened ate more but felt less negatively than did those who were unthreatened.

For feelings of stereotype threat, significant main effects indicated that both normal-weight and threatened participants reported lower feelings of threat than did overweight and unthreatened participants respectively. Finally, significant main effects revealed that in general, both highly invested and overweight participants endorsed worse state affect and self-esteem than did less invested and normal-weight participants respectively.

## **Discussion**

### **Objective weight analyses.**

*Eating.* It had been hypothesized that objectively overweight participants who had experienced a stereotype threat would behave more stereotypically (i.e., eat more candies) than would overweight participants in the control condition, and normal-weight participants in either condition. Moreover, it had been predicted that of threatened overweight participants, only those who were highly invested in their appearance would

exhibit increased eating. Given that only threatened overweight participants (in the 2-way ANOVA), and threatened and highly invested overweight participants (in the 3-way ANOVA), were expected to be impacted by the stereotype threat, it was predicted that the eating of all other groups would not significantly differ.

The predicted two-way interaction between weight and stereotype threat was partially supported, as threatened overweight participants ate more candies than did one other group—unthreatened overweight participants. The predicted three-way interaction between weight, threat, and appearance investment was not supported. These findings indicate that while threatened overweight individuals did generally behave more stereotypically by eating greater quantities, their eating was not moderated by appearance investment.

While normal-weight individuals were included as a control group, their eating did differ slightly by experimental condition. In particular, similar to the pattern observed in overweight participants, normal-weight participants who received a stereotype threat also ate more than did their unthreatened counterparts. Although the magnitude of this difference was not large enough to be significant (approximately 8 candies), it was sufficient to make it difficult for this group to serve as a comparison by which to elucidate the meaning of overweight participants' eating.

***State mood and self-esteem.*** The interpretation of the state mood and self-esteem data is limited by its administration following both the experimental manipulation and eating; thus, any significant differences may be attributable to the stereotype threat or eating alone, or to their combination. Regardless, there were no significant interactions

for these variables, indicating that participants' psychological state following a stereotype threat did not depend on their weight, how invested they were in their appearance, or a combination of the two. Thus, although all overweight participants ate more when threatened than when not, there was no evidence that the threat (perhaps in conjunction with eating) impacted their emotions or self-perceptions.

Main effects of weight were found for some variables, such that overweight individuals reported more guilty feelings, as well as lower appearance and social self-esteem, than did normal-weight individuals. However, it is impossible to ascertain whether these findings reflect dispositional characteristics, or overweight participants' reaction to specific experimental tasks, the most salient one being eating (the threat manipulation is precluded due to the nonsignificant interaction between threat and weight). There is some evidence for the latter, as no differences existed between overweight and normal-weight participants in trait self-esteem and depression (all  $ps > 0.29$ ), which were assessed before any experimental tasks had occurred. Thus, it appears that overweight individuals' characteristic self-esteem and mood were comparable to that of normal-weight individuals, but the former experienced more guilt and lower confidence in their appearance and social presentation after having eaten.

#### **Subjective weight analyses.**

**Eating.** The same hypotheses had been formulated for the subjective weight analyses as had been for the objective weight ones. Results partially supported the two-way interaction, in that self-rated overweight participants in the threat condition ate more than did one other group—overweight participants in the control condition. Contrary to

the objective weight analyses, the meaning of this difference was revealed here by comparing the eating of these two groups to the eating of subjectively normal-weight participants, which was relatively stable regardless of experimental condition. Overweight participants in the control condition ate a mean of 44.39 candies, while the means of the other three groups (overweight participants in the threat condition, and normal-weight participants in either condition) ranged from 58.26 to 62.75 candies. Therefore, it appears that the difference in consumption in overweight participants in the threat and control conditions was likely due to the restricted eating of the latter, rather than to the disinhibition of the former. In other words, in the absence of other influences on their behaviour, overweight participants (as compared to normal-weight participants) restricted their eating<sup>3</sup>. However, after a stereotype threat, overweight individuals increased their eating, although it was not the degree of overconsumption implied by the stereotype of this group's poor self-control. Instead, they simply ate the same amount as did normal-weight individuals. Nevertheless, this suggested a release of restricted eating.

However, given that the BMI of the subjectively overweight group was in the overweight range ( $M = 29.38$ ,  $SD = 5.02$ ), and that total caloric intake is a predictor of weight gain (Klesges, Klesges, Eck, & Shelton, 1995; Klesges, Klesges, Haddock, & Eck, 1992), it is likely that overweight individuals generally consume more than do normal-weight individuals, despite the evidence obtained here. To reconcile the present results with their weight, it may be that the self-identified overweight participants in this study

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In further support of the characteristic restrictive eating habits of overweight participants, this group ( $M = 18.22$ ,  $SD = 5.11$ ) had significantly higher restrained eating scores than did normal-weight participants ( $M = 10.94$ ,  $SD = 4.53$ ),  $t(147) = 9.18$ ,  $p < 0.001$ .

restrict their eating in public but disinhibit in private.

There was no evidence supporting the predicted three-way interaction for eating, in that highly invested overweight participants in the threat condition did not eat more candies than did any of the other groups. Thus, as had been found in the objective weight analyses, all threatened overweight participants behaved more stereotypically by eating more candies, but this effect was not moderated by appearance investment.

*State mood.* In terms of mood, a two-way interaction was revealed such that among overweight participants, those in the threat condition reported feeling less negative affect, fear, and hostility than did those in the control condition. However, given that the Negative Affect subscale is comprised of ten items that are drawn from the specific emotion subscales, six of which are from the Fear and Hostility subscales, these two emotions will be the focus of the subsequent discussion.

To elucidate the meaning of this difference, comparisons were made to normal-weight participants, whose mood generally did not vary by experimental condition. Overweight participants endorsed feeling more fearful and hostile than did normal-weight participants in the control but not in the threat condition, suggesting that in the absence of external influences, overweight participants experienced a greater intensity of these negative emotions than did normal-weight participants<sup>4</sup>. After stereotype threat however, overweight individuals' affect improved, so that their levels of fear and hostility were

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However, the main effects of weight for fear and hostility were not significant. This may have been due to their reduction in threatened overweight participants, which may have sufficiently diminished the overall scores of the overweight group so that any main effects of weight were eliminated.

comparable to those endorsed by normal-weight individuals. In other words, individuals who perceived themselves to be overweight were generally more fearful and hostile than were individuals who perceived themselves to be of normal-weight; however, under stereotype threat, these negative emotions appeared to abate. Nevertheless, given that mood was assessed following both the threat manipulation and eating, it is uncertain whether this abatement was due to stereotype threat or eating alone, or the result of eating after having been threatened.

Regardless, it is interesting to speculate on potential causes. Specifically, it may be a product of suppression. In their process model of stereotype threat, Schmader, Johns, and Forbes (2008) posited that threat motivates individuals to suppress negative feelings. Here, overweight participants may have successfully stifled their feelings so that they indeed felt less fearful and hostile following the threat, or at least attempted to appear so with their self-reports.

Main effects of weight were again found for guilt, and appearance and social self-esteem, such that subjectively overweight participants reported more guilt and lower self-esteem than did normal-weight participants. Trait depression and self-esteem scores revealed that in contrast to the objective weight analyses, which did not find any trait differences between objectively overweight and normal-weight participants, significant differences were obtained when weight was defined subjectively. In particular, participants who perceived themselves to be overweight had significantly higher trait depression scores ( $p = 0.01$ ), and marginally lower trait self-esteem scores ( $p = 0.06$ ), than did normal-weight participants. This suggests that the main effects of guilt and self-

esteem may have reflected characterological states in subjectively overweight participants, which would be consistent with our interpretation of the PANAS-X Fear and Hostility interactions. Again however, given that the state mood and self-esteem measures were administered following the eating task, the increased guilt and lowered self-esteem may have also reflected demoralization following eating.

*Feelings of stereotype threat.* For feelings of threat, main effects of both subjective weight and threat condition were found. In terms of the former, self-identified overweight participants felt more threatened than did self-identified normal-weight participants, regardless of assigned condition. In other words, the former were concerned that their eating had been used to confirm a stereotype about their weight group, regardless of whether this concern had been experimentally activated or not. Instead, given the pervasiveness of the stereotype that obese individuals have an uncontrollably indulgent relationship with food, the simple presence of food and the expectation of eating may have been sufficient to evoke fears of judgment. If this is accurate, then the eating task used in this study may have been threatening to all overweight participants, although it alone without the experimental manipulation appeared insufficient to produce stereotype-consistent behaviour (given that only threatened overweight participants were found to eat more). Moreover, the fact that a main effect of feeling threatened was found only when weight was defined subjectively may indicate that only individuals who actually identify as overweight or obese felt apprehensive after eating.

In terms of the main effect of experimental condition, all participants reported lower subjective feelings of stereotype threat in the threat than in the control condition.

This may have reflected their attempts to deny the existence of the threat experience. Similarly, von Hippel et al. (2005) found that threatened individuals engaged in denial, although the denial was in other areas—e.g., weakness in the domain in question, and the importance of the domain.

**Comparisons between objective and subjective weight results.** Both sets of analyses revealed that overweight participants in the threat condition ate more than did overweight participants in the control condition. However, only when weight was defined subjectively did threatened overweight participants report less negative affect, hostility, and fear than did unthreatened overweight participants. Thus, it would appear that changes in objective behaviour were revealed regardless of the method of weight definition, but only subjective categorizations revealed changes in phenomenological experience following a stereotype threat. This shows that the threat may be salient enough to impact the actions of all objectively overweight individuals, regardless of whether they overtly identify as being such or not. However, emotional impact may depend on individuals' self-affiliation with the stigmatized group. This suggests that behaviour can occur independently of subjective experience.

Although it had been hypothesized that individuals who value their physical appearance would be more reactive to stereotype threat, this was unsupported in either the objective or the subjective weight analyses. Thus, all overweight participants, regardless of their level of appearance investment, responded behaviourally to the threat. This may show that the pressure to disprove the stereotype of lack of dietary control is compelling enough to affect even individuals for whom confirmation of this stereotype would not be



especially personally significant (i.e., they are not as emotionally or behaviourally invested in attaining the sociocultural ideal of thinness as a means of affirming self-esteem). Instead, the consequences of corroborating such a stereotype—e.g., discrimination and negative generalizations to other attributes—may be sufficiently aversive to have disruptive behavioural effects on all overweight individuals.

Finally, although objectively overweight participants were not characteristically more depressed and less self-confident than were objectively normal-weight participants, subjectively overweight participants reported higher trait depression than did subjectively normal-weight participants. Although it has been found that obese individuals have poorer mental health (e.g., more mood and anxiety disorders) than do non-obese individuals (Onyike, Crum, Lee, Lyketsos, & Eaton, 2003; Roberts et al., 2000; Simon et al., 2006), these results suggest that the former are not all psychologically compromised. Instead, it may be that only those who self-identify as overweight or obese suffer. In addition, since the subjectively overweight group was also comprised of objectively normal-weight individuals who felt overweight, these results reinforce that emotional experience is less dependent on actual weight status than it is on affiliation with a particular weight group.

### Chapter III

#### **Study 2**

##### **Purpose and Hypotheses of Study 2**

The purpose of Study 2 was to investigate the effects of stereotype threat on overweight and obese females' intellectual performance. It was hypothesized that

overweight and obese participants (defined either with objective or subjective criteria) exposed to a stereotype threat would perform significantly worse on an intellectual measure than would overweight and obese participants unexposed to this threat, and normal-weight participants in either condition, with the latter three groups' performance expected to be statistically equivalent. It was also hypothesized that investment in academia as an important feature of the self would moderate the stereotype threat effect, such that highly invested overweight individuals would perform worse under conditions of threat than would: (a) highly invested overweight individuals in the control condition, (b) less invested overweight individuals in either condition, and (c) normal-weight individuals in either condition, regardless of investment. The performance of all other groups was not expected to differ, given that stereotype threat should not affect normal-weight participants or overweight participants who are less invested in their academic success.

In addition, the effects of removing stereotype threat on the intellectual performance of previously threatened overweight and obese participants was examined. Johns, Schmader, and Martens (2005) investigated the impact of education about stereotype threat on the performance of a targeted group. In this study, women and men completed a math test under the belief that it either assessed problem-solving or mathematical abilities. Moreover, in the math condition, a subset of participants were briefly informed of the nature of stereotype threat and the anxiety it may cause. It was found that women performed significantly worse than did men in the math-only condition, but the performance of the two groups did not differ in the problem-solving

and math-and-information conditions. In other words, the stereotype threat effect was removed in women when they were educated about the impact of stereotyping on behaviour. Therefore, in the present study, it was predicted that following debriefing, during which participants learned that their performance may have suffered after the introduction of a stereotype threat, the intellectual performance of the group expected to be most impacted by the threat (overweight and obese participants who are highly invested in their academic performance) would improve so that their performance would be equivalent to that of all other groups (their unthreatened counterparts, less invested overweight participants in either condition, and normal-weight participants regardless of academic investment and threat condition).

The basic design and many of the materials employed in Study 1 also were employed in Study 2. Therefore, only differences in materials and procedure between the two studies will be discussed in the following section.

## **Method**

**Participants.** One hundred and sixty-two female undergraduate students were recruited from the University of Windsor Department of Psychology participant pool to take part in the study in return for course credit. Eligible participants must not have had a current or past diagnosis of an eating disorder, which was assessed with the same screening question described in Study 1. In addition, they must not have participated in Study 1. However, previous participation in other studies conducted by the Eating Disorders and Anxiety Research Group was deemed acceptable, as the current study was ostensibly not about eating, eating disorders, or body image, and none of the procedures

or measures referred to these topics.

In terms of objective weight, the underweight and normal-weight groups, as well as the overweight and obese groups, were combined, because of the low number of participants whose BMI was in the underweight or obese range (4.3% and 17.9%, or *ns* of 7 and 29, respectively). After combining categories, 60% of the sample were either underweight or normal-weight (normal-weight  $n = 90$ ), while 40% were either overweight or obese<sup>5</sup> (overweight  $n = 36$ ). Table 11 displays BMI and age stratified by each of the independent variables (objective and subjective weights, experimental condition, and investment category).

In terms of subjective weight, the overweight and obese categories were again combined, as were the underweight and normal-weight categories, because of the low number of participants who identified themselves as either underweight or obese (2.5% and 5.6%, or *ns* of 4 and 9, respectively). Following this procedure, 58% of participants identified themselves as underweight or normal-weight (normal-weight  $n = 90$ ), while 42% identified as being overweight or obese (overweight  $n = 59$ ). Chi-square analyses indicated that subjective weight classification did not vary by threat condition or investment category (all  $ps > 0.52$ ). In the subsequent discussion of objective and subjective weight results, the two weight groups will be referred to as the normal-weight

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Fourteen participants did not consent to having their weight and height measured to calculate their BMI; therefore, their self-reported weight and height were used to estimate their BMI.

Table 11

*Body Mass Index and Age Stratified by Objective Weight, Subjective Weight, Threat Condition, and Academic Investment*

	Total Sample	Objective Weight		Subjective Weight		Experimental Condition		Academic Investment	
		Underweight/ Normal- weight	Overweight/ Obese	Underweight/ Normal- weight	Overweight/ Obese	Control	Threat	Low	High
<i>n</i>	162	97	65	94	68	81	81	80	82
BMI	24.87 (5.29)	21.36 (1.99) <sup>a</sup>	30.12 (4.22) <sup>b</sup>	21.59 (2.60) <sup>a</sup>	29.41 (4.68) <sup>b</sup>	25.33 (5.97)	24.41 (4.51)	24.72 (5.07)	25.02 (5.53)
Age	22.57 (5.86)	21.71 (4.75) <sup>a</sup>	23.85 (7.04) <sup>b</sup>	21.98 (4.98)	23.38 (6.84)	22.06 (5.34)	23.09 (6.34)	23.73 (7.36) <sup>a</sup>	21.45 (3.62) <sup>b</sup>

*Note.* BMI = body mass index.

a-b. Significantly different at the 0.05 level in comparisons within each independent variable category.

and overweight groups. Although the BMI of the latter group fell just in the obese range, this was done to maintain consistency with the terms used in Study 1.

Participants' self-reported ethnicity was as follows: 79.6% were Caucasian, 8.0% were African-Canadian, 5.5% were Asian, 3.7% were Middle Eastern, 0.6% were Hispanic, 0.6% were Native-Canadian, and 1.9% identified an "other" ethnicity (e.g., biracial).

**Design.** The study employed a 2 x 2 x 2 factorial design, with stereotype threat (presence or absence), weight status (objectively/subjectively overweight or normal-weight), and domain identification (high or low) as between-subjects factors. Participants were classified as high or low in domain identification through a median split of total scores on the Domain Identification Measure.

**Measures.** Table 12 outlines the measures used in Study 2, and their function in the statistical analyses.

***Intellectual Measure–Pre-Debriefing.*** Following the majority of stereotype threat research in the intellectual domain (e.g., Aronson et al., 1999; Steele & Aronson, 1995), the intellectual measure used in this study was constructed using difficult items from past Graduate Record Examination (GRE) general tests (Educational Testing Service, 1994). Steele and Aronson noted that the test following the induction of stereotype threat should be difficult, because it would be more likely to engender frustration and self-doubt, which may then heighten concern about confirming stereotypes. Moreover, O'Brien and Crandall (2003) found that stereotype threat only

Table 12

*Measures Used in Study 2 and Their Function in the Statistical Analyses*

Independent Variable
Domain Identification Measure
Dependent Variables
Experience and Perception of Intellectual Measure
Positive and Negative Affect Schedule–Expanded Form
Post-debriefing Intellectual Measure
Pre-debriefing Intellectual Measure
State Self-Esteem Scale
Stereotype Threat Assessment
Potential Covariates
Beck Depression Inventory-II
Rosenberg Self-Esteem Scale
Other
Demographic Questionnaire

impaired women's performance on a difficult math test; on an easy test, the threat actually improved performance relative to that of a control group. The authors attributed this pattern of results to increased arousal caused by stereotype threat—arousal should increase dominant responses, which would aid easy tasks but hinder difficult ones. Based on this empirical research, an item was selected for use in this study only if it had been answered correctly by less than 50% of previous GRE examinees.

Following Inzlicht, Aronson, Good, and McKay (2006) and Schmader (2002), 20 items were chosen. Similar to Nguyen, O'Neal, and Ryan (2003), these items came from all three sections of the GRE—Verbal, Quantitative, and Analytical (composed of logic problems), and all three sections were approximately equally represented (there was one fewer Quantitative item). The goal of equal representation was to ensure that participants would not underperform simply because of weakness in a particular area (e.g., math), which may occur if the task was comprised entirely of one type of problem (e.g., Quantitative). Items from the three sections were randomly ordered to construct the questionnaire, except for a block of five Analytical items, which were grouped together because they were all based on a paragraph describing certain logical conditions. However, the placement of this block of items was randomly determined.

In addition, following each item, a 7-point Likert scale was provided for participants to rate their confidence in their response (from “not at all confident” to “extremely confident”). A mean confidence score was calculated and used in all subsequent analyses.

***Intellectual Measure—Post-Debriefing.*** This version of the intellectual measure



consisted of 10 GRE items—three Quantitative, three Analytical, and four Verbal—that were randomly presented, except for two Analytical items that appeared together following a description of logical conditions. Items were chosen based on the selection criteria described above.

***Domain Identification Measure (DIM).*** The DIM is a 16-item self-report measure designed specifically for stereotype threat research, to assess identification with the English and Mathematics academic domains (J. L. Smith & White, 2001). These two areas roughly corresponded to those assessed by this study's intellectual measure—English with the GRE Verbal and Analytical sections, and Math with the GRE Quantitative section. Responses on the DIM were recorded on a 5-point Likert scale, and summed to produce an overall General Academic Identification score. Higher responses were indicative of greater academic identification.

In a validation study conducted with undergraduate students, the internal consistency of the two subscales ranged from 0.56-0.58, and test-retest reliability at 1-3 months ranged from 0.56-0.89 (J. L. Smith & White, 2001). Construct validity was demonstrated, as high scorers on the Mathematics subscale answered significantly more questions correctly on a subsequent math test than did low scorers, and also reported enjoying the test more. Moreover, as was predicted from previous research, males scored higher on the Mathematics subscale than did females, while the reverse pattern was found on the English subscale.

***Experience and Perception of Intellectual Measure (EPIM).*** An 8-item measure (Appendix Q), with items based on those used in previous research (Aronson et al., 1999;

Shih et al., 1999; Steele & Aronson, 1995), was constructed to explore participants' experience and perception of the pre-debriefing intellectual measure (e.g., motivation and effort while working, assessment of test bias and difficulty).

***Stereotype Threat Assessment (Appendix R).*** The measure of feelings of stereotype threat used in Study 1 was modified slightly to reflect the new behavioural domain of interest (i.e., number of problems answered correctly on the intellectual measure rather than eating).

***Other measures.*** The DQ, PANAS-X, and SSES described in Study 1 also were employed.

***Procedure.*** Participants were recruited using the same procedure as described in Study 1. A cover story was used to mask this study's true purpose. Specifically, the description on the participant pool website stated that we were investigating the effects of problem-solving strategies and personality on memory. The rationale continued that both factors may impact the strategies that people use to remember something (e.g., someone with good problem-solving strategies or a more open personality may use more creative mnemonic devices).

All participants were tested individually, and the experimenter was blind to the stereotype threat condition of each by using the same procedure described in Study 1. Upon arrival to the laboratory, participants first read and signed a consent form (Appendix S), and were given a letter of information (Appendix T). Then they were reminded of the fictitious purpose and procedures of the study. Regarding the procedures, they were told that they would first complete two mood questionnaires,

before reading four paragraphs related to social issues in transportation. Then, they would complete 20 verbal and math problems, followed by several questionnaires. To provide a rationale for the order of the tasks, participants were informed that the problems and questionnaires followed the reading task to serve as distractors to prevent memory rehearsal. The recall test would be administered last. Finally, participants were told that they would complete an additional 10 problems to pilot items for a future study.

Following this explanation, participants completed the Rosenberg Self-Esteem Scale and the Beck Depression Inventory-II. Then, the four excerpts were presented in the same manner as in Study 1, after which participants were presented with the verbal and math problems in paper format. They were instructed to “approach this test as you would any other test”—for example, they did not have to complete items in order, and could omit items. They also were instructed to rate their level of confidence for each response they provided. Finally, to ensure genuine effort, participants were informed that some of the items would be difficult, “because we are interested in the processes involved in solving challenging problems.” They were encouraged to try their best and to give their best effort. Following Inzlicht et al. (2006), they were given 20 minutes to complete the problems, and were instructed to double-check their responses if they had completed all items before the time was up.

Participants then completed all remaining questionnaires—Demographic Questionnaire, Domain Identification Measure, Experience and Perception of Intellectual Measure (EPIM), Positive and Negative Affect Schedule—Expanded Form, and State Self-Esteem Scale. The EPIM was administered first to ensure that the pre-debriefing

intellectual measure was still vivid in participants' memory, as it assessed factors related to this measure (e.g., an estimate of the number of problems guessed). All other questionnaires were presented in random order.

After completion of the questionnaires, participants completed the free recall test using the procedures outlined in Study 1. Then, they completed the Stereotype Threat Assessment measure, were debriefed (Appendix U), and signed a final consent form (Appendix V) if they consented to retain their data in the study (all consented).

Following debriefing, participants completed the 10 additional verbal and math problems in an allotted time of 10 minutes. They still believed that these items constituted a pilot test, and were informed of the true purpose of the test after its completion. Finally, consenting participants had their weight and height measured following the Study 1 procedures.

**Analytical strategy.** Table 13 outlines the analyses that were used in Study 1. Similar to Study 1, analyses were conducted using SPSS 18.0. Missing data were replaced with mean imputation (i.e., inserting the mean of a participant's score on a measure or subscale). Five pieces of data were missing: one BDI-II item (an intended covariate) for four participants, and one PANAS-X Hostility item (a dependent variable)

Table 13

*Hypotheses and Analytical Strategy for Study 2*

Hypotheses	Dependent Variable	Analyses
Threatened overweight participants would perform significantly worse on an intellectual measure than would unthreatened participants, and normal-weight participants in either condition. The performance of the latter three groups was not expected to differ.	Pre-debriefing intellectual measure -Problems correct -Accuracy	<ol style="list-style-type: none"> <li>1. 2 (stereotype threat) x 2 (objective/subjective weight) x 2 (investment) between-subjects ANOVA</li> <li>2. Planned comparisons:               <ol style="list-style-type: none"> <li>a. Compared the performance of threatened overweight participants with the other 3 groups (one-tailed tests)</li> <li>b. Compared the performance of the other 3 groups with each other (two-tailed tests)</li> </ol> </li> </ol>
Highly invested overweight participants in the stereotype threat condition would perform worse than would: (a) highly invested overweight participants in the control condition, (b) lowly invested overweight participants in either condition, and (c) normal-weight participants in either condition, regardless of academic investment. The performance of the other seven groups was not expected to differ.		<ol style="list-style-type: none"> <li>1. 2 (stereotype threat) x 2 (objective/subjective weight) x 2 (investment) between-subjects ANOVA</li> <li>2. Planned comparisons:               <ol style="list-style-type: none"> <li>a. Compared the performance of highly invested overweight participants in the threat condition with the other 7 groups (one-tailed tests)</li> <li>b. Compared the performance of the other 7 groups with each other (two-tailed tests)</li> </ol> </li> </ol>
Following debriefing, the performance of threatened and highly invested overweight participants would improve to the level of all other groups.	Post-debriefing intellectual measure -Accuracy	2 (stereotype threat) x 2 (objective/subjective weight) x 2 (investment) mixed-design ANOVA -Within-subjects factor: accuracy on the pre- and post-debriefing intellectual measures

Hypotheses	Dependent Variable	Analyses
None	Experience and Perception of Intellectual Measure -Difficulty -Biassedness -Problems solved -Problems guessed -Effort -Motivation -Pressure	-2 (stereotype threat) x 2 (objective/subjective weight) x 2 (investment) between-subjects ANOVA -Simple effects analyses only if interaction terms were significant
	State mood: PANAS-X -Negative Affect -Positive Affect -Assuredness -Fear -Guilt -Hostility -Joviality -Sadness -Serenity	-2 (stereotype threat) x 2 (objective/subjective weight) x 2 (investment) between-subjects ANOVA -Simple effects analyses only if interaction terms were significant -Covariates used in the objective weight analyses for specific subscales: -Assuredness: BDI-II -Guilt: BDI-II and RSES -Joviality: BDI-II -Positive Affect: BDI-II -Covariates used in the subjective weight analyses for specific subscales: -Assuredness: BDI-II -Joviality: BDI-II -Positive Affect: BDI-II

Hypotheses	Dependent Variable	Analyses
None	State self-esteem: SSES -Performance -Appearance -Social	-2 (stereotype threat) x 2 (objective/subjective weight) x 2 (investment) between-subjects ANOVA -Simple effects analyses only if interaction terms were significant -Covariates used in the objective weight analyses for specific subscales: -Performance: BDI-II and RSES -Social: BDI-II and RSES
	Feelings of stereotype threat: STA	-2 (stereotype threat) x 2 (objective/subjective weight) x 2 (investment) between-subjects ANOVA -Simple effects analyses only if interaction terms were significant

*Note.* BDI-II = Beck Depression Inventory–II; PANAS-X = Positive and Negative Affect Schedule–Expanded Form; RSES = Rosenberg Self-Esteem Scale; SSES = State Self-Esteem Scale; STA = Stereotype Threat Assessment.

for one participant<sup>6</sup>. Outliers for each dependent variable were identified and Winsorised (Howell, 2002), although further transformations were not performed because of the robustness of ANOVA to non-normality (Howell, 2002). Data is presented for Winsorised variables when this procedure had been performed.

*Planned analyses.* A 2 x 2 x 2 design was employed, with stereotype threat, weight status, and academic investment category as between-subjects factors. To assess whether the performance of threatened and highly invested overweight participants improved after debriefing, a 2 x 2 x 2 mixed-design ANOVA was employed, with the same between-subjects factors described above, and with accuracy on the pre- and post-debriefing intellectual measures as the within-subjects factor. All analyses were performed twice, once each for objective and subjective definitions of weight.

Because there were a priori hypotheses for performance on the pre-debriefing intellectual measure regarding the two-way interaction between threat condition and weight, and the three-way interaction between threat condition, weight, and academic investment, planned comparisons were conducted for performance on this measure (number correct and accuracy) regardless of the significance of the interaction effects (Howell, 2002; Rosnow & Rosenthal, 1988). Moreover, because it had been hypothesized that the intellectual performance of threatened and highly invested

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Additional missing items were: confidence ratings for one item on the pre-debriefing intellectual measure for five participants, and confidence ratings for one item on the post-debriefing intellectual measure for seven participants. It was reasoned that missing data on these variables was due to participants overlooking the confidence ratings after having solved a difficult problem. Moreover, mean imputation was not performed here because confidence for one solved item may have little relation to confidence for another solved item.



overweight participants would improve after debriefing, planned comparisons assessing pre- and post-debriefing performance in each of the eight groups also were conducted regardless of the significance of the ANOVA terms (it was expected that significant improvement would exist only in threatened and highly invested overweight participants). Because no a priori hypotheses were proffered for the other dependent variables, post-hoc tests of simple effects analyses (Field, 2009) were conducted only if the omnibus interaction terms were significant.

***Dependent variables.*** Dependent variables were performance on the pre-debriefing intellectual measure (number correct and accuracy; Steele & Aronson, 1995), state mood (PANAS-X) and self-esteem (SSES), feelings of stereotype threat (STA), and participants' experience while completing the intellectual measure (EPIM).

***Potential covariates.*** Trait self-esteem (RSES) and depression (BDI-II) were again examined as potential covariates for the state mood and self-esteem analyses, to ascertain if these variables acted as significant covariates and met the assumptions of ANCOVA. The outcome of this data checking will be discussed first for the objective weight analyses<sup>7</sup>. Firstly, when examining the significance of these two covariates in the same model, the RSES was a significant covariate for the PANAS-X Guilt scale and all three SSES subscales, while the BDI-II emerged as a significant covariate in all analyses except for the SSES Appearance scale. Secondly, the assumption of independence was

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As will be discussed in the Assumptions of ANOVA section below, some variables were logarithmically transformed to decrease positive skewness. These corrected variables were used in examining ANCOVA assumptions for both the objective and the subjective weight analyses.

met, as the two covariates did not significantly differ between the levels of the independent variables (all  $ps > 0.06$ ). Thirdly, the assumption of linearity between the dependent variables and the covariates also was met, as all Pearson correlations were significant (all  $ps < 0.02$ ). Finally, for the analyses that included one potential covariate (the non-significant covariate had been excluded), the assumption of homogeneity of regression slopes (Stevens, 2002) was violated for the following variables, as indicated by significant 2- or 3-way interactions between the independent variable(s) and the covariate (all  $ps < 0.05$ ): SSES Appearance subscale, and the PANAS-X Negative Affect, Fear, Hostility, Sadness, Attentiveness, and Serenity scales. For the analyses that included two potential covariates, all variables met the assumption of parallelism of the regression planes (Stevens, 2002).

Therefore, in the objective weight analyses, both the RSES and BDI-II were used as covariates in the SSES Performance and Social, as well as the PANAS-X Guilt, analyses; the BDI-II alone was used as a covariate in the PANAS-X Positive Affect, Joviality, and Assuredness analyses. All these covariates were significant, and had met all ANCOVA assumptions. When analyses involved covariates, estimated marginal means and standard errors will be reported.

For the subjective weight analyses, the RSES was a significant covariate for the PANAS-X Guilt scale as well as all three SSES subscales, while the BDI-II was a significant covariate in all analyses except for the SSES Appearance subscale. However, the assumption of independence between the RSES and weight category was not met, as subjectively overweight participants had significantly lower trait self-esteem than did

subjectively normal-weight participants ( $p = 0.04$ ). Therefore, the RSES could not be used as a covariate. Independence was satisfied for the BDI-II. The assumption of linearity between the BDI-II and the dependent variables was tenable, as all Pearson correlations were significant (all  $ps < 0.001$ ). Finally, in analyses in which the BDI-II was a significant covariate, the assumption of homogeneity of regression slopes was violated for all SSES and PANAS-X subscales, except for the PANAS-X Positive Affect, Joviality, and Assuredness scales (violations were indicated by interactions between the independent variable(s) and the BDI-II at  $ps < 0.05$ ). Therefore, for the subjective weight analyses, the BDI-II was used as a covariate for only the three aforementioned PANAS-X subscales.

## **Results**

**Reliability analyses.** The internal consistency of all measures as assessed by Cronbach's alpha coefficients are displayed in Table 14. The reliability analyses revealed coefficients ranging from 0.64 to 0.93. Stereotype Threat Assessment had a reliability below the recommended cut-off of 0.70 (Cronbach's alpha = 0.64; Nunnally & Bernstein, 1994), and was thus interpreted with caution.

### **Objective weight analyses.**

**Assumptions of ANOVA.** The normality assumption was assessed for all dependent variables with standardized skewness and kurtosis scores, and Kolmogorov-Smirnov statistics. The Kolmogorov-Smirnov test was significant for all dependent variables ( $ps < 0.03$ ) except for participants' mean confidence ratings for the pre-debriefing intellectual measure, indicating that these distributions significantly deviated

Table 14

*Study 2: Descriptive Data and Internal Consistency for Measures and Intellectual Performance Variables (N = 162)*

Variable	Range	Mean (SD)	Cronbach's $\alpha$	Significantly Skewed?	Significant Kurtosis?
Pre-debriefing intellectual measure: Number correct	0.00-11.00	4.01 (2.29)		Yes—positively	No
Pre-debriefing intellectual measure: Accuracy	0.00-90.00	30.70 (18.06)		Yes—positively	No
Pre-debriefing intellectual measure: Mean confidence	1.30 - 6.38	4.00 (1.10)		No	No
Post-debriefing intellectual measure: Number correct	0.00 - 6.00	2.01 (1.44)		Yes—positively	No
Post-debriefing intellectual measure: Accuracy	0.00-100.00	25.88 (20.10)		Yes—positively	Yes—positive
Post-debriefing intellectual measure: Mean confidence	1.00 - 6.17	3.99 (1.14)		Yes—positively	No
Beck Depression Inventory-II	0.00-35.00	8.86 (6.27)	0.86		
Domain Identification Measure	28.00-72.00	47.47 (8.00)	0.78		
Rosenberg Self-Esteem Scale	8.00-30.00	23.05 (4.54)	0.86		

Variable	Range	Mean ( <i>SD</i> )	Cronbach's $\alpha$	Significantly Skewed?	Significant Kurtosis?
PANAS–Expanded Form					
Negative Affect	10.00-29.00	13.49 (3.88)	0.77	Yes–positively	No
Positive Affect	11.00-45.00	25.24 (7.72)	0.88	No	No
Assuredness	6.00-24.00	13.06 (4.69)	0.82	Yes–positively	No
Fear	6.00-17.00	7.89 (2.32)	0.72	Yes–positively	Yes–positive
Guilt	6.00-17.00	7.35 (2.27)	0.83	Yes–positively	Yes–positive
Hostility	6.00-19.00	7.30 (2.12)	0.75	Yes–positively	Yes–positive
Joviality	8.00-33.00	18.57 (7.48)	0.93	No	Yes–negative
Sadness	5.00-20.00	7.15 (3.02)	0.83	Yes–positively	Yes–positive
Serenity	3.00-15.00	9.52 (2.77)	0.79	No	No
State Self-Esteem Scale					
Appearance	8.00-30.00	20.16 (4.87)	0.85	Yes–negatively	No
Performance	11.00-35.00	26.10 (5.11)	0.85	Yes–negatively	No
Social	14.00-35.00	27.91 (5.29)	0.86	Yes–negatively	No
Stereotype Threat Assessment	4.00-14.00	5.23 (2.16)	0.64	Yes–positively	No

Variable	Range	Mean ( <i>SD</i> )	Cronbach's $\alpha$	Significantly Skewed?	Significant Kurtosis?
EPIM					
Difficulty of measure	4.00 - 8.00	6.61 (1.10)		No	Yes–negatively
Biassedness of measure	1.00 - 8.00	3.95 (2.13)		No	Yes–negatively
Estimate of problems correctly solved	0.00-15.00	4.77 (3.14)		Yes–positively	No
Estimate of problems guessed	0.00-20.00	7.30 (5.24)		Yes–positively	No
Effort	3.00 - 8.00	6.27 (1.14)		Yes–negatively	No
Motivation	2.00 - 8.00	5.63 (1.63)		Yes–negatively	No
Pressure	1.00 - 8.00	5.08 (1.96)		Yes–negatively	No

*Note.*  $\alpha$  = alpha; EPIM = Experience and Perception of Intellectual Measure; *SD* = standard deviation; PANAS = Positive and Negative Affect Schedule.

from normality. Skewness and kurtosis information are displayed in Table 14.

Transformations of non-normal variables were not conducted because ANOVA is generally robust to non-normality (Howell, 2002).

Homogeneity of variance was assessed with Levene's test, and by comparing the smallest and largest variances of each ANOVA cell to ensure that the latter is not four times the former (Howell, 2002). Levene's test was significant for Stereotype Threat Assessment, the PANAS-X Negative Affect and Hostility scales, and the SSES Social subscale (all  $ps < 0.05$ ). Moreover, for Stereotype Threat Assessment, and the PANAS-X Negative Affect and Hostility scales, the largest cell variances were greater than four times the smallest variances. Because these variables violated both tests of homogeneity, they were logarithmically transformed and used in all objective weight analyses. However, the means of the untransformed data will still be reported.

***Vignette comprehension.*** The mean accuracy (number correct/number attempted) of participants' responses to the vignette comprehension questions was 96.58%. There were no significant main effects, or interactions between threat condition, weight, and academic investment (all  $ps > 0.11$ ).

***Main analyses.*** Table 15 displays the means and standard deviations of all dependent variables as a function of threat condition, objective weight group, and academic investment group.

***Number of correctly solved problems on pre-debriefing intellectual measure.*** The three-way ANOVA revealed no significant main or interaction effects on number of

Table 15

*Study 2: Means and Standard Deviations of Dependent Measures as Function of Threat Condition, Objective Weight Status, and Academic Investment*

Variable	Stereotype Threat				Control			
	Overweight		Normal-weight		Overweight		Normal-Weight	
	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.
<i>n</i>	20	12	25	24	12	21	23	25
Pre-DIM: Number correct	3.75 (1.65)	4.42 (2.84) <sup>c</sup>	3.88 (2.22)	4.46 (2.64) <sup>c</sup>	4.25 (2.42)	4.05 (2.52)	3.26 (2.36) <sup>d</sup>	4.28 (1.93)
Pre-DIM: Accuracy	27.06 (15.18)	33.00 (22.02) <sup>a</sup>	33.16 (17.99) <sup>a</sup>	34.63 (20.84) <sup>a</sup>	29.36 (14.94)	31.58 (19.31) <sup>c</sup>	22.02 (15.05) <sup>bd</sup>	33.81 (16.29) <sup>a</sup>
Pre-DIM: Mean confidence	3.48 (1.35)	4.64 (0.75)	3.74 (1.17)	4.29 (0.88)	4.02 (0.99)	4.46 (1.09)	3.35 (0.83)	4.37 (0.99)
Post-DIM: Number correct	1.95 (1.36)	1.92 (1.88)	1.96 (1.34)	2.50 (1.44)	2.17 (1.70)	1.95 (1.16)	1.70 (1.52)	1.96 (1.46)
Post-DIM: Accuracy	23.65 (17.86)	34.98 (34.41)	27.45 (19.82)	30.92 (17.27)	24.98 (21.45)	26.17 (21.75)	23.12 (24.04)	24.32 (18.27)
Post-DIM: Mean confidence	3.56 (1.15)	4.33 (0.82)	3.70 (1.26)	4.40 (0.81)	4.40 (1.07)	4.22 (1.04)	3.22 (1.19)	4.38 (1.06)



Variable	Stereotype Threat				Control			
	Overweight		Normal-weight		Overweight		Normal-Weight	
	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.
EPIM								
Difficulty of measure	6.90 (1.12)	5.83 (1.03)	6.96 (0.98)	6.42 (0.93)	6.58 (1.31)	6.31 (1.23)	6.78 (1.13)	6.72 (1.02)
Bias of measure	3.50 (1.67)	2.50 (1.73)	4.32 (2.17)	4.50 (2.38)	2.92 (2.19)	4.38 (1.72)	4.00 (2.41)	4.20 (2.10)
Problems solved	4.40 (2.70)	7.00 (3.66)	3.28 (1.86)	5.26 (3.12)	5.91 (4.06)	5.69 (3.32)	3.87 (3.25)	4.68 (2.87)
Problems guessed	8.82 (5.56)	4.91 (2.77)	6.22 (5.04)	6.65 (3.83)	7.00 (6.20)	5.52 (4.81)	11.17 (5.79)	6.96 (5.01)
Effort	6.00 (1.30)	6.25 (1.14)	6.20 (0.91)	6.46 (0.88)	6.50 (1.24)	6.71 (1.01)	5.74 (1.36)	6.40 (1.19)
Motivation	5.55 (1.90)	6.17 (1.11)	5.12 (1.64)	5.92 (1.41)	5.50 (1.57)	6.00 (1.18)	5.26 (1.86)	5.76 (1.85)
Pressure	5.05 (2.01)	4.83 (1.90)	4.36 (2.36)	5.21 (1.50)	4.08 (2.31)	5.48 (1.54)	5.22 (2.02)	5.84 (1.80)
PANAS-X								
Negative affect	12.80 (2.61)	11.92 (1.88)	13.12 (4.24)	13.25 (3.99)	15.83 (6.46)	13.10 (2.91)	14.17 (4.34)	13.98 (3.46)
Positive affect	26.54 (1.66)	25.84 (2.14)	23.38 (1.48)	27.97 (1.52)	23.09 (2.14)	23.61 (1.62)	24.67 (1.55)	26.11 (1.48)
Assuredness	13.65 (0.99)	13.82 (1.27)	12.18 (0.88)	14.51 (0.91)	12.73 (1.27)	12.34 (0.97)	11.48 (0.92)	13.94 (0.88)
Fear	7.10 (1.45)	7.50 (1.78)	8.00 (2.80)	7.71 (2.58)	8.75 (3.02)	8.00 (2.28)	8.13 (2.58)	8.04 (1.77)
Guilt	7.32 (0.43)	6.69 (0.55)	7.53 (0.38)	6.73 (0.40)	8.40 (0.55)	7.70 (0.42)	7.28 (0.40)	7.39 (0.38)

Variable	Stereotype Threat				Control			
	Overweight		Normal-weight		Overweight		Normal-Weight	
	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.
Hostility	6.90 (1.41)	6.62 (1.29)	7.12 (1.92)	6.83 (1.13)	9.33 (4.27)	6.86 (1.39)	7.91 (2.57)	7.40 (1.91)
Joviality	20.54 (1.57)	18.00 (2.03)	18.02 (1.41)	20.52 (1.45)	14.83 (2.03)	17.47 (1.54)	18.40 (1.47)	18.86 (1.40)
Sadness	6.45 (2.46)	6.08 (2.02)	6.80 (3.35)	7.67 (3.53)	8.17 (3.97)	7.43 (2.84)	6.65 (2.01)	7.82 (3.30)
Serenity	9.75 (2.63)	10.28 (2.40)	9.60 (3.34)	10.00 (2.48)	8.08 (2.64)	9.14 (2.39)	8.74 (2.96)	9.90 (2.77)
SSES								
Performance	26.83 (0.91)	26.88 (1.17)	25.30 (0.81)	28.27 (0.85)	25.95 (1.17)	25.46 (0.89)	23.92 (0.85)	26.48 (0.81)
Appearance	17.70 (5.90)	19.25 (3.67)	21.24 (4.48)	22.17 (4.66)	17.58 (4.38)	18.10 (4.45)	19.91 (4.95)	22.78 (3.45)
Social	28.15 (0.96)	26.72 (1.23)	27.72 (0.86)	30.02 (0.89)	26.87 (1.24)	27.96 (0.94)	27.10 (0.89)	27.64 (0.86)
STA	5.25 (2.22)	5.92 (3.65)	4.92 (2.04)	5.12 (1.87)	4.58 (1.16)	5.28 (1.93)	5.17 (2.04)	5.64 (2.38)

*Note.* EPIM = Experience and Perception of Intellectual Measure; Invest. = investment; PANAS-X = Positive and Negative Affect Schedule–Expanded Form; Pre-DIM = pre-debriefing intellectual measure; Post-DIM = post-debriefing intellectual measure; SSES = State Self-Esteem Scale; STA = Stereotype Threat Assessment.

a-b. Significantly different at the 0.05 level.

c-d. Significantly different at the 0.10 level.

correctly solved problems (all  $ps > 0.17$ ). However, because a priori hypotheses had been formulated, planned comparisons were conducted to test these hypotheses. In these analyses, one-tailed tests were used when predictions involved one group being expected to perform worse than the other groups, while predictions involving no performance differences were analysed with two-tailed tests.

Planned comparisons testing the hypothesized two-way interaction between weight and threat condition revealed no significant group differences (all  $ps > 0.34$ ). Thus, contrary to hypotheses, threatened overweight participants did not answer fewer items correctly on the intellectual measure than did any of the other groups. Similarly, planned comparisons testing the hypothesized three-way interaction between weight, academic investment, and threat condition did not indicate any significant differences between groups (all  $ps > 0.07$ ). Thus, the hypothesis that highly invested overweight participants in the threat condition would answer fewer items correctly than would all other groups was not supported.

*Accuracy on pre-debriefing intellectual measure.* There were again no significant main or interaction effects on accuracy (all  $ps > 0.06$ ). Planned comparisons assessing the predicted two-way interaction also did not reveal any significant group differences (all  $ps > 0.11$ ).

Planned comparisons testing the predicted three-way interaction also did not support hypotheses. Although it was predicted that highly invested overweight participants in the threat condition would perform worse than would all other groups, planned comparisons actually revealed that the worst performance was exhibited by less

invested normal-weight participants in the control condition, as the accuracy of this group was significantly lower than that of four other groups' (all  $ps < 0.05$ ; see Figure 6 and Table 15 for identification of these groups). There were no significant main or interaction effects for number of problems attempted (all  $ps > 0.15$ ), indicating that differences in accuracy were not due to differences in attempts.

*Experience of pre-debriefing intellectual measure.* Because no hypotheses had been formulated for the remaining variables (perception of pre-debriefing intellectual measure, state mood and self-esteem, and feelings of stereotype threat), simple effects analyses using two-tailed tests were conducted only if the ANOVA interaction terms were significant. Moreover, Table 16 displays the means and standard deviations of these dependent variables stratified by the three independent variables of interest (objective weight, experimental condition, and investment category). Significant main effects also are noted in this table, and thus this statistical information will not be repeated in-text.

Following each completed problem on the intellectual measure, participants rated their confidence in the accuracy of their response. The ANOVA revealed a significant main effect of academic investment, such that highly invested participants were more confident than were less invested ones.

On the EPIM, which assessed various aspects of participants' perception of the pre-debriefing intellectual measure, there were significant main effects of academic investment for perceived difficulty, estimates of problems solved and guessed, motivation, and felt pressure. Highly invested participants reported finding the measure less difficult, solving more problems on it and guessing on fewer, and feeling more

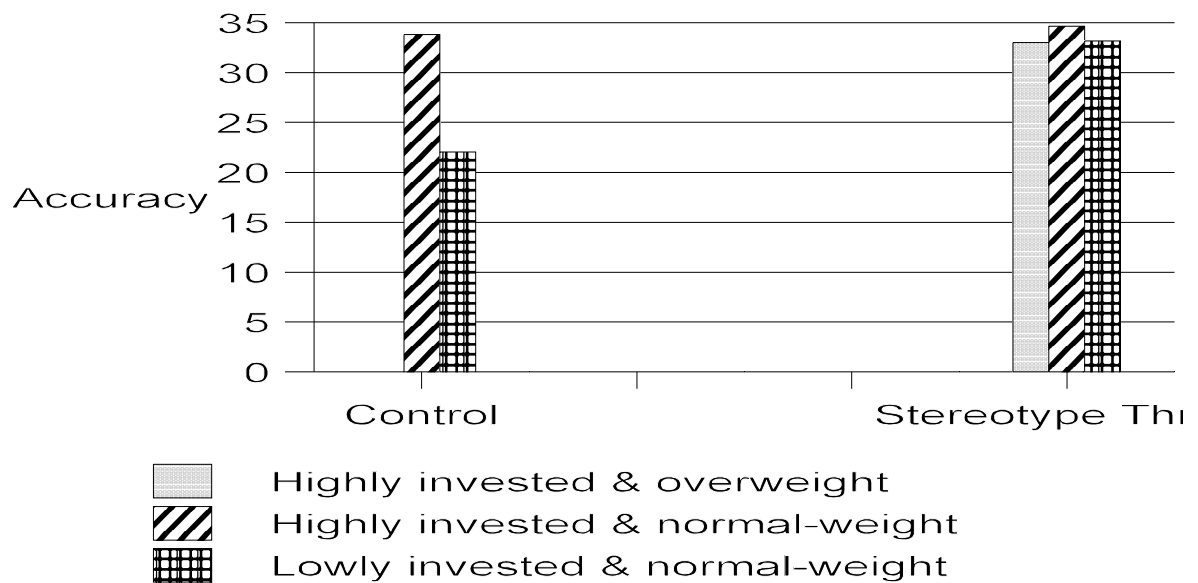


Figure 6. Graph of the finding that the pre-debriefing intellectual measure accuracy of less academically invested and objectively normal-weight participants in the control condition was significantly lower than that of four other groups’.

Table 16

*Study 2: EPIM, State Mood, State Self-Esteem, and Feelings of Stereotype Threat Stratified by Threat Condition, Objective Weight, and Academic Investment*

Variable	Threat Condition		Objective Weight		Academic Investment	
	Control	Threat	Normal-weight	Overweight	Low invest.	High invest.
Pre-DIM: Mean confidence	4.04 (1.06)	3.96 (1.15)	3.94 (1.05)	4.09 (1.19)	3.60 (1.11) <sup>a</sup>	4.40 (0.94) <sup>b</sup>
EPIM						
Difficulty of measure	6.61 (1.14)	6.62 (1.07)	6.72 (1.02) <sup>c</sup>	6.45 (1.21) <sup>d</sup>	6.84 (1.10) <sup>a</sup>	6.40 (1.07) <sup>b</sup>
Bias of measure	4.00 (2.13)	3.90 (2.15)	4.26 (2.24) <sup>a</sup>	3.49 (1.90) <sup>b</sup>	3.81 (2.15)	4.08 (2.12)
Problems solved	4.88 (3.31)	4.66 (2.97)	4.26 (2.87) <sup>a</sup>	5.55 (3.38) <sup>b</sup>	4.10 (2.94) <sup>a</sup>	5.43 (3.20) <sup>b</sup>
Problems guessed	7.81 (5.72)	6.76 (4.64)	7.74 (5.28)	6.62 (5.14)	8.47 (5.83) <sup>a</sup>	6.20 (4.36) <sup>b</sup>
Effort	6.31 (1.24)	6.23 (1.04)	6.21 (1.12)	6.37 (1.18)	6.06 (1.20) <sup>c</sup>	6.48 (1.04) <sup>d</sup>
Motivation	5.64 (1.66)	5.62 (1.60)	5.52 (1.71)	5.80 (1.49)	5.32 (1.74) <sup>a</sup>	5.93 (1.46) <sup>b</sup>
Pressure	5.31 (1.93)	4.85 (1.98)	5.15 (1.99)	4.97 (1.93)	4.74 (2.18) <sup>a</sup>	5.41 (1.67) <sup>b</sup>
PANAS-X						
Negative Affect	14.08 (4.17) <sup>a</sup>	12.90 (3.50) <sup>b</sup>	13.62 (3.98)	13.29 (3.76)	13.75 (4.39)	13.24 (3.33)
Positive Affect	24.37 (0.86)	25.93 (0.86)	25.53 (0.75)	24.77 (0.96)	24.42 (0.86)	25.88 (0.85)
Assuredness	12.62 (0.51)	13.54 (0.51)	13.03 (0.45)	13.13 (0.57)	12.51 (0.51)	13.65 (0.51)

Variable	Threat Condition		Objective Weight		Academic Investment	
	Control	Threat	Normal-weight	Overweight	Low invest.	High invest.
Fear	8.16 (2.32) <sup>c</sup>	7.62 (2.30) <sup>d</sup>	7.97 (2.42)	7.77 (2.17)	7.92 (2.51)	7.85 (2.14)
Guilt	7.69 (0.22) <sup>a</sup>	7.07 (0.22) <sup>b</sup>	7.23 (0.19)	7.53 (0.25)	7.63 (0.22)	7.13 (0.22)
Hostility	7.69 (2.56) <sup>a</sup>	6.91 (1.48) <sup>b</sup>	7.31 (1.95)	7.28 (2.36)	7.62 (2.58) <sup>a</sup>	6.98 (1.49) <sup>b</sup>
Joviality	17.39 (0.81)	19.27 (0.81)	18.95 (0.71)	17.71 (0.90)	17.94 (0.82)	18.71 (0.81)
Sadness	7.44 (2.98)	6.86 (3.05)	7.24 (3.12)	7.01 (2.88)	6.88 (2.92)	7.42 (3.11)
Serenity	9.10 (2.74) <sup>a</sup>	9.94 (2.76) <sup>b</sup>	9.57 (2.90)	9.45 (2.58)	9.16 (2.97) <sup>a</sup>	9.87 (2.53) <sup>b</sup>
State Self-Esteem Scale						
Appearance	19.98 (4.71) <sup>a</sup>	20.34 (5.06) <sup>b</sup>	21.55 (4.47) <sup>a</sup>	18.09 (4.74) <sup>b</sup>	19.42 (5.14)	20.88 (4.52)
Performance	25.45 (0.47) <sup>a</sup>	26.82 (0.47) <sup>b</sup>	25.99 (0.41)	26.28 (0.53)	25.50 (0.47) <sup>a</sup>	26.77 (0.47) <sup>b</sup>
Social	27.39 (0.49)	28.15 (0.49)	28.12 (0.44)	27.42 (0.55)	27.46 (0.50)	28.08 (0.49)
STA	5.26 (2.16)	5.21 (2.32)	5.22 (2.08)	5.26 (2.31)	5.02 (1.96)	5.44 (2.34)

*Note.* EPIM = Experience and Perception of Intellectual Measure; Invest. = investment; PANAS-X = Positive and Negative Affect Schedule–Expanded Form; STA = Stereotype Threat Assessment.

a-b. Significantly different at the 0.05 level in comparisons within each independent variable category.

c-d. Significantly different at the 0.10 level in comparisons within each independent variable category.

motivated and more pressure while working, than did less invested participants.

However, for estimates of problems correctly solved, the main effect of investment was qualified by a significant interaction between investment and threat condition,  $F(1, 151) = 3.88, p = 0.05, \eta^2 = 0.02$ . Simple effects analyses revealed that the estimates of participants high and low in academic investment did not significantly differ in the control condition ( $p = 0.37$ ); however, in the threat condition, highly invested participants ( $M = 5.82, SD = 3.35$ ) estimated that they had correctly solved more problems than did less invested participants ( $M = 3.78, SD = 2.32$ ),  $F(1, 158) = 8.75, p = 0.004, \eta^2 = 0.05$ . See Figure 7 for a visual representation of this interaction.

There were significant main effects of weight for estimates of problems solved and perceived fairness of the measure. Overweight participants found the measure less biased, and estimated that they had solved more problems correctly on it, than did normal-weight participants.

In addition, there was a significant two-way interaction between threat condition and weight for effort,  $F(1, 154) = 4.03, p = 0.05, \eta^2 = 0.02$ . Simple effects analyses indicated that overweight participants reported expending less effort in the threat ( $M = 6.09, SD = 1.23$ ) than in the control ( $M = 6.64, SD = 1.08$ ) condition,  $F(1, 161) = 3.77, p = 0.05, \eta^2 = 0.02$ . The effort of normal-weight participants did not significantly differ by condition ( $p = 0.29$ ). In addition, in the control condition, overweight participants reported investing more effort than did normal-weight participants ( $M = 6.08, SD = 1.30$ ),  $F(1, 161) = 4.29, p = 0.04, \eta^2 = 0.03$ . The effort of normal-weight and overweight



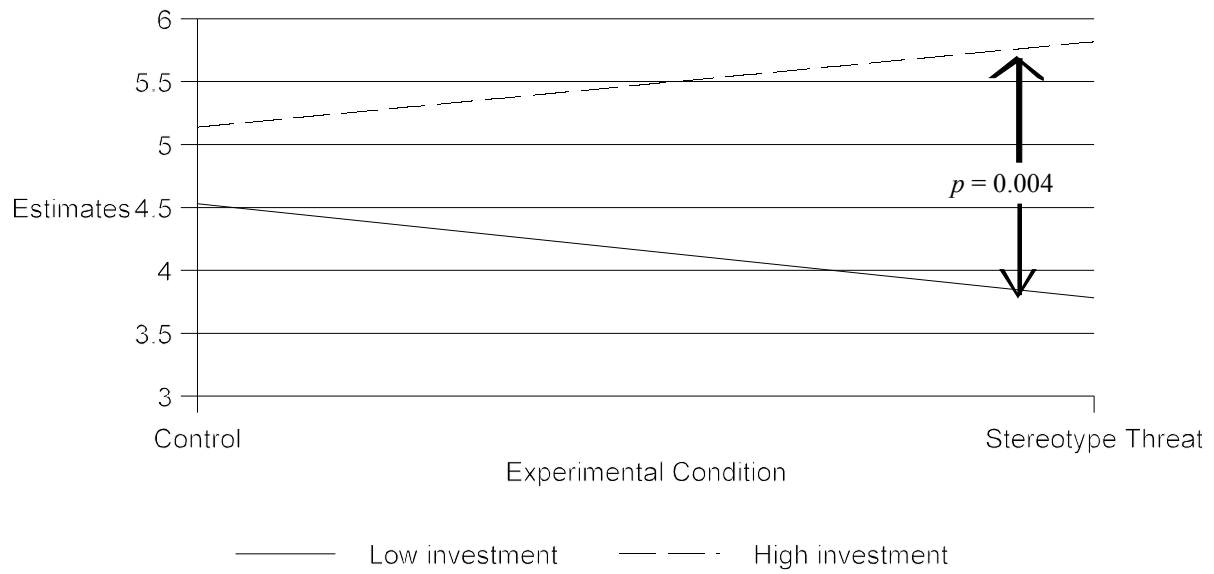


Figure 7. Estimates of problems correctly solved as a function of experimental condition and academic investment.

participants did not significantly differ in the threat condition ( $p = 0.43$ ). See Figure 8 for a graph of this interaction.

*State mood.* There were significant main effects of stereotype threat for the PANAS-X Negative Affect, Hostility, Guilt, and Serenity scales. Participants in the threat condition reported feeling less negative affect, hostility, and guilt, and more serenity, than did participants in the control condition. For Hostility and Serenity, there were also significant main effects of academic investment, with highly invested participants endorsing less hostility and more serenity than did less invested participants. None of the ANOVA main or interaction effects for the other PANAS-X subscales were significant (all  $ps > 0.09$ ).

*State self-esteem.* For Performance self-esteem, there was a significant main effect of stereotype threat, such that participants in the threat condition reported higher self-esteem than did participants in the control condition. There was also a significant interaction between weight and academic investment,  $F(1, 152) = 5.10, p = 0.03, \eta^2 = 0.02$ . Simple effects analyses were conducted on the standardized residuals of Performance self-esteem (obtained by regressing the dependent variable onto the covariates), because the RSES and BDI-II were used as covariates. These analyses revealed that among less invested individuals, those who were overweight ( $M = 26.39, SD = 0.74$ ) reported higher state self-esteem than did those who were normal-weight ( $M = 24.61, SD = 0.58$ ),  $F(1, 159) = 5.28, p = 0.02, \eta^2 = 0.03$ . Self-esteem did not significantly differ by weight status among highly invested individuals ( $p = 0.11$ ). Additionally, among normal-weight individuals, those who were highly invested ( $M = 27.37, SD =$

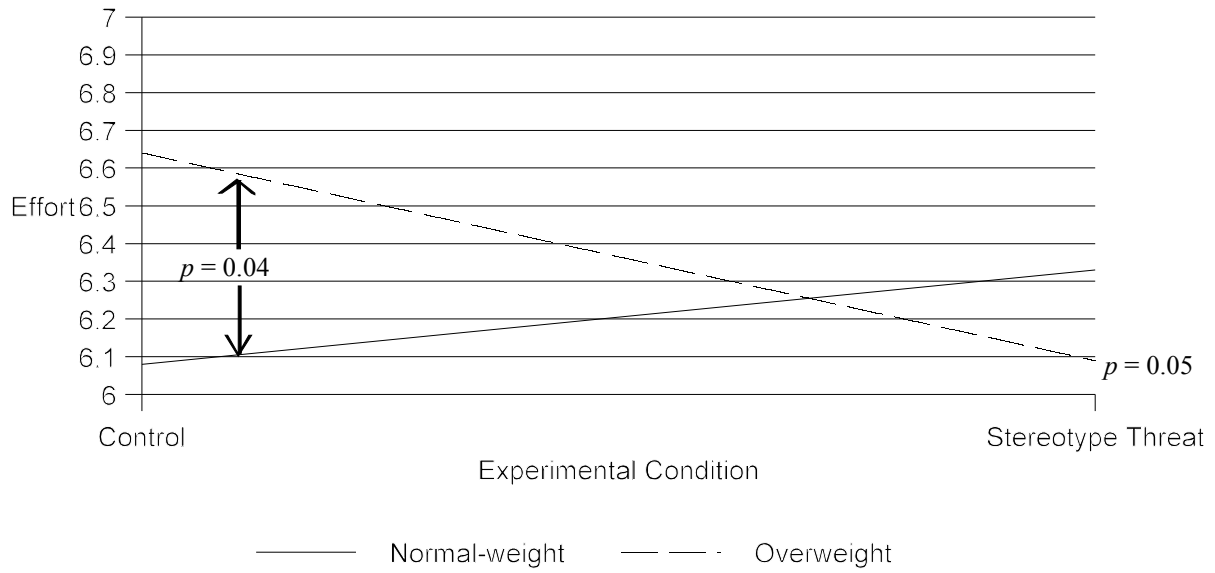


Figure 8. Self-reported effort as a function of experimental condition and objective weight.

0.59) endorsed higher self-esteem than did those who were less invested,  $F(1, 159) = 10.32, p = 0.002, \eta^2 = 0.06$ . Self-esteem did not significantly differ by investment among overweight individuals ( $p = 0.61$ ). Thus, a pattern emerged such that normal-weight participants who had low academic investment were consistently found to endorse the lowest performance self-esteem. See Figure 9 for a visual depiction of this interaction.

For Appearance self-esteem, there were significant main effects of weight and academic investment, such that overweight and less invested participants reported lower self-esteem than did normal-weight and highly invested participants. There were no significant main or interaction effects for Social self-esteem (all  $ps > 0.13$ ).

*Feelings of stereotype threat.* On the STA, which assessed feelings of stereotype threat on the pre-debriefing intellectual measure, there were no significant main or interaction effects (all  $ps > 0.19$ ).

*Performance on intellectual measure from pre- to post-debriefing.* The three-way mixed design ANOVA revealed only a significant main effect of time,  $F(1, 154) = 4.22, p = 0.04, \text{partial } \eta^2 = 0.03$ , with all participants achieving lower accuracy on the post-debriefing intellectual measure ( $M = 26.60, SD = 21.23$ ) than they did on the pre-debriefing one ( $M = 30.64, SD = 17.90$ ). Planned comparisons assessing change in performance within each of the eight experimental groups revealed that contrary to hypotheses, highly invested overweight participants in the threat condition did not perform better after learning about stereotype threat during debriefing ( $p = 0.82$ ). Similarly, no differences in pre- and post-debriefing accuracy were found in the other seven groups (all  $ps > 0.06$ ).

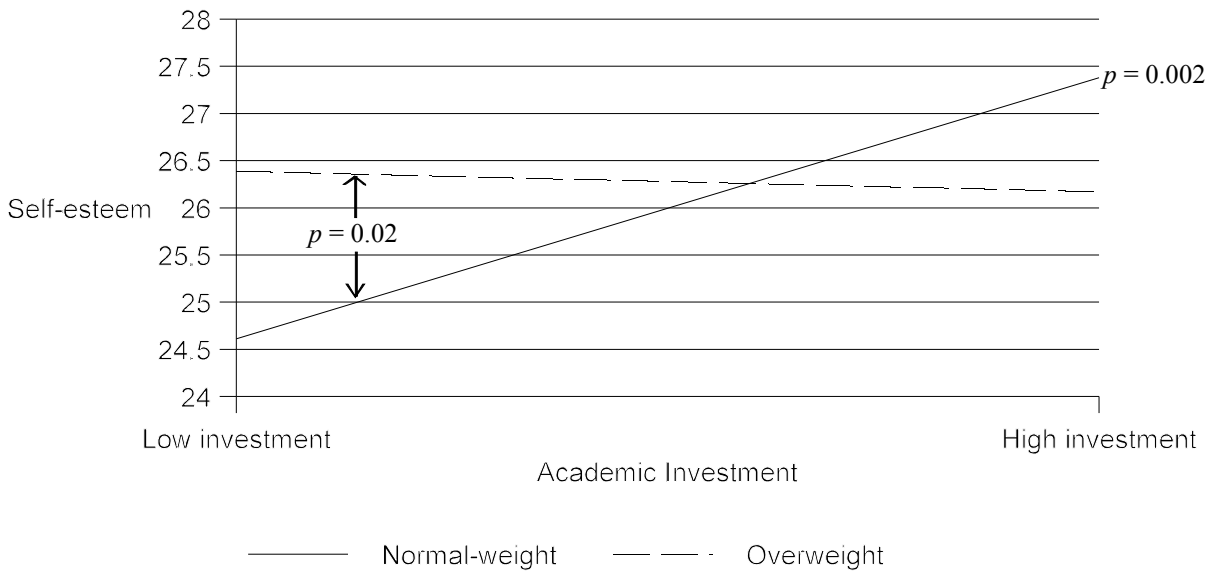


Figure 9. State performance self-esteem as a function of objective weight and academic investment.

*Summary of objective weight results.* Table 17 summarizes the results of the objective weight analyses. Contrary to hypotheses, on the pre-debriefing intellectual measure, the worst performance was exhibited by less academically invested normal-weight participants in the control condition, who performed less accurately than did four other groups. Moreover, all groups performed less accurately on the post-debriefing intellectual measure as compared to the pre-debriefing one, with no significant variations within groups.

Participants in the stereotype threat condition reported less negative mood and higher performance self-esteem than did participants in the control condition. Moreover, overweight participants generally had a more positive experience of the pre-debriefing intellectual measure than did normal-weight participants, with the former finding the measure less biased, and estimating that they had solved more problems correctly on it, than did the latter. In addition, overweight participants reported expending less effort in the threat than in the control condition. They also endorsed lower appearance self-esteem than did normal-weight participants.

Highly invested participants also had a better experience of the pre-debriefing intellectual measure than did less invested participants, with the former finding the measure less difficult, estimating that they had solved more problems correctly on it and guessing on fewer, and feeling more motivated and more pressure while working, than did the latter. However, for estimates of problems correctly solved, this difference was primarily observed in the threat rather than in the control condition. Highly invested participants also reported less hostility, more serenity, and higher appearance self-esteem, than did less invested participants.

Table 17

*Summary of the Objective Weight Results for Study 2*

Hypotheses	Dependent Variable	Results
<p>Threatened overweight participants would perform significantly worse on an intellectual measure than would unthreatened participants, and normal-weight participants in either condition. The performance of the latter three groups was not expected to differ.</p>	<p>Pre-debriefing intellectual measure -Problems correct -Accuracy</p>	<p>Hypotheses not supported: overweight participants in the threat condition did not perform worse than did any other group.</p>
<p>Highly invested overweight participants in the stereotype threat condition would perform worse than would: (a) highly invested overweight participants in the control condition, (b) lowly invested overweight participants in either condition, and (c) normal-weight participants in either condition, regardless of academic investment. The performance of the other seven groups was not expected to differ.</p>		<p>Hypotheses not supported: highly invested overweight participants in the threat condition did not perform worse than did any other group.</p>
		<p>Less academically invested normal-weight participants in the control condition performed less accurately than did four other groups.</p>

Hypotheses	Dependent Variable	Results
Following debriefing, the performance of threatened and highly invested overweight participants would improve to the level of all other groups.	Post-debriefing intellectual measure	Hypotheses not supported: highly invested overweight participants in the threat condition did not perform better after learning about stereotype threat during debriefing.
	-Accuracy	All groups performed less accurately on the post-debriefing intellectual measure as compared to the pre-debriefing one.
None	Experience and Perception of Intellectual Measure -Difficulty -Biassedness -Problems solved -Problems guessed -Effort -Motivation -Pressure	<p>-Main effect of academic investment: highly invested participants reported finding the measure less difficult, solving more problems on it and guessing on fewer, and feeling more motivated and more pressure while working, than did less invested participants.</p> <p>-Main effect of weight: overweight participants found the measure less biased, and estimated that they had solved more problems correctly on it, than did normal-weight participants.</p> <p>-Two-way interaction of investment and threat condition for estimates of problems correctly solved: in the threat condition, highly invested participants estimated that they had correctly solved more problems than did less invested participants.</p> <p>-Two-way interaction of weight and threat condition for effort: overweight participants reported expending less effort in the threat than in the control condition.</p>



Hypotheses	Dependent Variable	Results
None	State mood: PANAS-X -Negative Affect -Positive Affect -Assuredness -Fear -Guilt -Hostility -Joviality -Sadness -Serenity	-Main effect of threat condition: threatened participants reported feeling less Negative Affect, Hostility, and Guilt, and more Serenity, than did unthreatened participants. -Main effect of academic investment: highly invested participants endorsed less Hostility and more Serenity than did less invested participants.
	State self-esteem: SSES -Performance -Appearance -Social	-Main effect of threat condition: threatened participants reported higher Performance self-esteem than did unthreatened participants. -Main effect of weight: overweight participants reported lower Appearance self-esteem than did normal-weight participants. -Main effect of investment: less invested participants reported lower Appearance self-esteem than did highly invested participants. -Two-way interaction weight and investment for Performance self-esteem: among less invested individuals, those who were overweight reported higher state self-esteem than did those who were normal-weight.
	Feelings of stereotype threat: STA	No significant results

*Note.* BDI-II = Beck Depression Inventory–II; PANAS-X = Positive and Negative Affect Schedule–Expanded Form; RSES = Rosenberg Self-Esteem Scale; SSES = State Self-Esteem Scale; STA = Stereotype Threat Assessment.

**Subjective weight analyses.** These analyses followed the same format as the ones for objective weight, except that weight was defined using subjective criteria—participants' identification of their own weight status.

**Participant characteristics.** Eighty-five participants who were classified as objectively normal-weight also classified themselves in this category for the subjective weight analyses (BMI  $M = 21.03$ ,  $SD = 1.89$ ). Twelve objectively normal-weight participants self-identified as overweight or obese (BMI  $M = 23.68$ ,  $SD = 0.85$ ). Nine objectively overweight or obese participants classified themselves as normal-weight (BMI  $M = 26.89$ ,  $SD = 2.49$ ). Fifty-six objectively overweight or obese participants self-identified with this weight group (BMI  $M = 30.64$ ,  $SD = 4.23$ ).

**Assumptions of ANOVA.** The normality of the dependent variables' distribution had already been assessed. However, because weight was defined differently, homogeneity of variance was checked again using Levene's test, and by comparing the smallest and largest variances of each ANOVA. Levene's test was significant for the PANAS-X Negative Affect, Hostility, and Guilt subscales, the SSES Social subscale, and the EPIM questions regarding number of questions guessed and perceived pressure (all  $ps < 0.05$ ). Moreover, for all the PANAS-X subscales, the largest cell variances were greater than four times the smallest variances. Because the PANAS-X variables were positively skewed and showed significant heterogeneous variance, they were logarithmically transformed (Howell, 2002). These transformed variables were used for all subjective weight analyses, although the untransformed means will still be reported for ease of interpretation.

***Vignette comprehension.*** For mean accuracy of the vignette comprehension items, there were no significant main effects, or interactions between threat condition, weight, and academic investment (all  $ps > 0.05$ ).

***Main analyses.*** Means and standard deviations as a function of threat condition, subjective weight, and academic investment are displayed in Table 18. Therefore, these data will not be presented in-text when discussing three-way interactions.

***Number of correctly solved problems on pre-debriefing intellectual measure.*** The three-way ANOVA indicated no significant main or interaction effects on number of correct answers (all  $ps > 0.09$ ). However, planned comparisons were conducted to test a priori hypotheses.

Planned comparisons testing the hypothesized two-way interaction between weight and threat condition revealed no significant group differences (all  $ps > 0.31$ ). Thus, contrary to predictions, threatened overweight participants did not answer fewer items correctly on the intellectual measure than did any of the other groups. Similarly, planned comparisons testing the hypothesized three-way interaction between weight, academic investment, and threat condition did not indicate any significant group differences (all  $ps > 0.08$ ). Thus, the hypothesis that highly invested overweight participants in the threat condition would answer fewer items correctly than would all other groups was also not supported.

***Accuracy on pre-debriefing intellectual measure.*** For accuracy, there was a significant main effect of academic investment,  $F(1, 154) = 4.51, p = 0.04, \eta^2 = 0.03$ ,

Table 18

*Study 2: Means and Standard Deviations of Dependent Measures as Function of Threat Condition, Subjective Weight Status, and Academic Investment*

Variable	Stereotype Threat				Control			
	Overweight		Normal-weight		Overweight		Normal-Weight	
	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.
<i>n</i>	19	13	26	23	13	23	22	23
Pre-DIM: Number correct	3.79 (1.62)	4.62 (2.81) <sup>e</sup>	3.85 (2.22)	4.35 (2.64)	3.38 (2.29) <sup>f</sup>	4.13 (2.47)	3.73 (2.49)	4.22 (1.93)
Pre-DIM: Accuracy	27.42 (15.31)	34.97 (23.99) <sup>a</sup>	32.66 (17.92)	33.59 (19.57)	25.48 (16.17)	30.81 (18.76)	23.98 (14.96) <sup>b</sup>	34.77 (16.46) <sup>a</sup>
Pre-DIM: Mean confidence	3.37 (1.32)	4.73 (0.61)	3.81 (1.18)	4.22 (0.90)	3.66 (1.10)	4.48 (1.13)	3.53 (0.84)	4.34 (0.94)
Post-DIM: Number correct	2.05 (1.22)	2.15 (1.82)	1.88 (1.42)	2.39 (1.50)	1.69 (1.60)	1.96 (1.26)	1.95 (1.59)	1.96 (1.40)
Post-DIM: Accuracy	25.42 (17.07)	34.48 (31.97)	26.01 (20.40)	31.02 (18.66)	19.98 (21.14)	25.51 (21.68)	25.98 (24.05)	24.82 (18.05)
Post-DIM: Mean confidence	3.65 (1.07)	4.50 (0.61)	3.64 (1.31)	4.32 (0.90)	4.01 (1.14)	4.26 (1.04)	3.40 (1.31)	4.35 (1.06)

Variable	Stereotype Threat				Control			
	Overweight		Normal-weight		Overweight		Normal-Weight	
	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.
EPIM								
Difficulty of measure	7.16 (0.96) <sup>a</sup>	5.69 (0.85) <sup>b</sup>	6.77 (1.07)	6.52 (0.95) <sup>a</sup>	6.77 (1.36)	6.28 (1.25)	6.68 (1.09)	6.78 (0.95)
Biassedness of measure	3.74 (1.85)	3.38 (2.10)	4.11 (2.10)	4.09 (2.50)	3.38 (2.47)	4.35 (1.75)	3.77 (2.35)	4.22 (2.11)
Estimate of problems solved	4.00 (2.81)	7.17 (3.74)	3.62 (1.92)	5.09 (2.96)	3.92 (2.47)	5.85 (3.16)	4.86 (4.11)	4.43 (2.92)
Estimate of problems guessed	10.12 (5.18) <sup>c</sup>	4.67 (2.42) <sup>d</sup>	5.26 (4.56) <sup>b</sup>	6.86 (3.91)	7.08 (5.20) <sup>d</sup>	6.04 (4.97)	11.32 (6.23) <sup>a</sup>	6.54 (4.96) <sup>b</sup>
Effort	6.21 (1.32)	6.54 (0.97)	6.04 (0.91)	6.30 (0.97)	6.31 (1.32)	6.56 (0.99)	5.82 (1.37)	6.52 (1.24)
Motivation	5.53 (1.68)	6.15 (1.14)	5.15 (1.83)	5.91 (1.41)	5.61 (1.56)	5.83 (1.11)	5.18 (1.87)	5.91 (1.95)
Pressure	5.10 (1.88)	5.54 (1.33)	4.35 (2.42)	4.83 (1.75)	5.08 (2.06)	5.39 (1.50)	4.68 (2.25)	5.96 (1.82)
PANAS-X								
Negative affect	12.84 (2.63) <sup>b</sup>	12.62 (1.98)	13.08 (4.18)	12.91 (4.11)	17.31 (6.42) <sup>a</sup>	13.15 (2.81)	13.23 (3.56) <sup>b</sup>	14.00 (3.59)
Positive affect	25.35 (1.71)	25.01 (2.06)	24.39 (1.47)	28.49 (1.55)	23.26 (2.06)	24.21 (1.55)	24.63 (1.58)	25.76 (1.55)
Assuredness	12.44 (1.02)	13.36 (1.23)	13.13 (0.88)	14.77 (0.93)	11.87 (1.23)	13.01 (0.93)	11.93 (0.95)	13.42 (0.92)
Fear	7.32 (1.49)	7.62 (1.76)	7.81 (2.78)	7.65 (2.62)	9.46 (3.12)	8.17 (2.21)	7.68 (2.25)	7.87 (1.79)

Variable	Stereotype Threat				Control			
	Overweight		Normal-weight		Overweight		Normal-Weight	
	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.	Low Invest.	High Invest.
Guilt	7.68 (2.29)	7.08 (1.70)	7.23 (1.94)	6.70 (1.72)	9.23 (3.53)	7.48 (2.31)	6.91 (2.39)	7.26 (1.98)
Hostility	6.79 (1.44) <sup>b</sup>	6.72 (1.22)	7.19 (1.88)	6.78 (1.17)	10.23 (4.26) <sup>a</sup>	7.22 (1.78)	7.32 (1.89) <sup>b</sup>	7.09 (1.65)
Joviality	19.96 (1.62)	18.56 (1.95)	18.56 (1.39)	20.26 (1.47)	14.60 (1.95)	18.36 (1.47)	18.68 (1.50)	18.14 (1.47)
Sadness	6.58 (2.48)	7.23 (3.03)	6.69 (3.32)	7.09 (3.31)	8.46 (3.84)	7.85 (3.67)	6.41 (1.82)	7.43 (2.39)
Serenity	9.37 (2.65)	10.77 (2.09)	9.88 (3.29)	10.00 (2.56)	7.77 (3.03)	9.50 (2.04)	8.95 (2.68)	9.61 (3.12)
SSES								
Performance	25.21 (5.81)	26.31 (3.90)	26.23 (5.19)	28.78 (3.26)	22.54 (4.99)	25.89 (5.16)	25.27 (5.87)	26.91 (4.89)
Appearance	16.58 (5.34)	18.23 (4.06)	21.92 (4.28)	22.87 (3.92)	16.61 (3.57)	18.37 (4.51)	20.59 (4.93)	22.91 (3.36)
Social	26.84 (5.91)	26.54 (4.91)	28.42 (6.25)	30.30 (4.00)	24.15 (5.56)	28.13 (3.82)	28.14 (6.45)	28.26 (3.79)
Stereotype Threat Assessment	4.89 (2.08)	6.00 (3.46)	5.19 (2.15)	5.04 (1.92)	5.23 (1.83)	5.96 (2.44)	4.82 (1.79)	5.00 (1.78)

*Note.* EPIM = Experience and Perception of Intellectual Measure; Invest. = investment; PANAS-X = Positive and Negative Affect Schedule–Expanded Form; Pre-DIM = pre-debriefing intellectual measure; Post-DIM = post-debriefing intellectual measure; SSES = State Self-Esteem Scale.

a-b, c-d. Pairs significantly different at the 0.05 level.

e-f. Significantly different at the 0.10 level.

such that highly invested participants ( $M = 33.36$ ,  $SD = 19.01$ ) responded more accurately than did less invested participants ( $M = 27.86$ ,  $SD = 16.34$ ). Planned comparisons assessing the predicted two-way interaction did not reveal any significant group differences (all  $ps > 0.26$ ).

Planned comparisons testing the predicted three-way interaction found a difference that was in the opposite direction than was expected. Specifically, highly invested overweight participants in the threat condition performed more accurately than did one other group—less invested normal-weight participants in the control condition,  $t(154) = 1.76$ ,  $p = 0.04$ , Cohen's  $d = 0.55$ . The latter group also performed significantly less accurately than did highly invested normal-weight participants in the control condition,  $t(154) = 2.02$ ,  $p = 0.04$ , Cohen's  $d = 0.67$ . There were no significant main or interaction effects for number of problems attempted, indicating that differences in accuracy were not due to differences in attempts (all  $ps > 0.16$ ). See Figure 10 for a visual representation of the significant between-groups differences in accuracy.

*Experience of pre-debriefing intellectual measure.* Table 19 displays the means and standard deviations of the remaining dependent variables stratified by the three independent variables of interest. Significant main effects also are noted here; therefore, this statistical information will not be repeated in the text.

For participants' mean confidence ratings, which were completed after every problem attempted, the ANOVA revealed a significant main effect of academic investment. Highly invested participants expressed more confidence in their responses than did less invested participants.



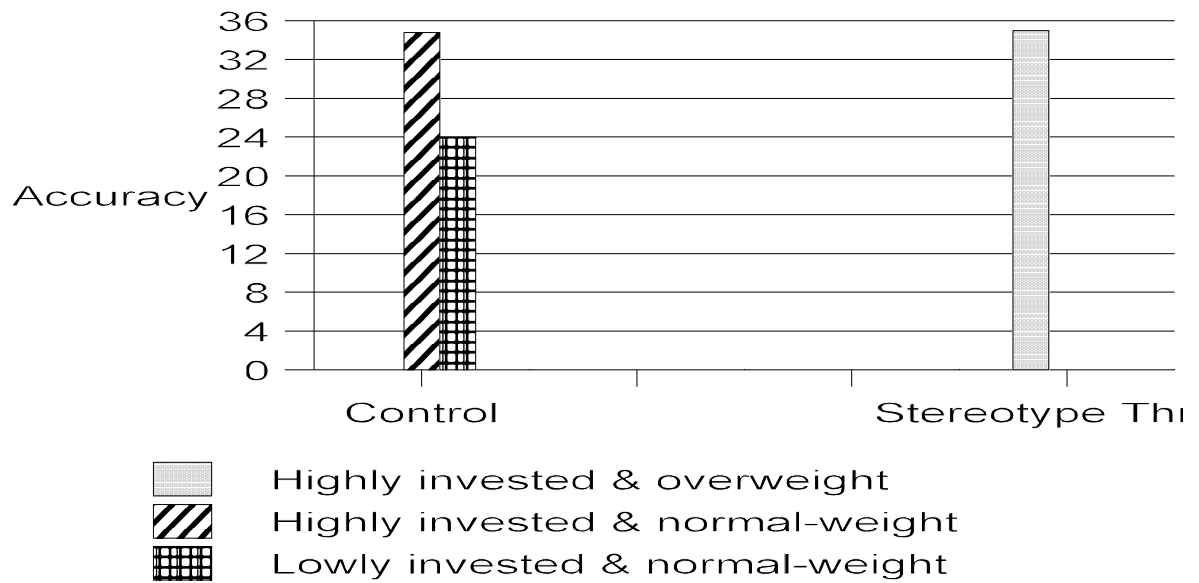


Figure 10. Graph of the finding that the pre-debriefing intellectual measure accuracy of less academically invested and subjectively normal-weight participants in the control condition was significantly lower than that of two other groups’.

Table 19

*Study 2: EPIM, State Mood, State Self-Esteem, and Feelings of Stereotype Threat Stratified by Threat Condition, Subjective Weight, and Academic Investment*

Variable	Threat Condition		Subjective Weight		Academic Investment	
	Control	Threat	Normal-weight	Overweight	Low invest.	High invest.
Pre-DIM: Mean confidence	4.04 (1.06)	3.96 (1.15)	3.97 (1.02)	4.04 (1.22)	3.60 (1.11) <sup>a</sup>	4.40 (0.94) <sup>b</sup>
EPIM						
Difficulty of measure	6.61 (1.14)	6.62 (1.07)	6.69 (1.07)	6.51 (1.23)	6.84 (1.10) <sup>a</sup>	6.40 (1.07) <sup>b</sup>
Biassedness of measure	4.00 (2.13)	3.90 (2.15)	4.05 (2.24)	3.81 (1.99)	3.81 (2.15)	4.08 (2.12)
Problems solved	4.88 (3.31)	4.66 (2.97)	4.46 (3.04)	5.20 (3.25)	4.10 (2.94) <sup>a</sup>	5.43 (3.20) <sup>b</sup>
Problems guessed	7.81 (5.72)	6.76 (4.64)	7.47 (5.41)	7.06 (5.02)	8.47 (5.83) <sup>a</sup>	6.20 (4.36) <sup>b</sup>
Effort	6.31 (1.24)	6.23 (1.04)	6.17 (1.14)	6.41 (1.14)	6.06 (1.20) <sup>a</sup>	6.48 (1.04) <sup>b</sup>
Motivation	5.64 (1.66)	5.62 (1.60)	5.53 (1.79)	5.76 (1.37)	5.32 (1.74) <sup>a</sup>	5.93 (1.45) <sup>b</sup>
Pressure	5.31 (1.93)	4.85 (1.98)	4.94 (2.14)	5.28 (1.67)	4.74 (2.18) <sup>a</sup>	5.41 (1.67) <sup>b</sup>

Variable	Threat Condition		Subjective Weight		Academic Investment	
	Control	Threat	Normal-weight	Overweight	Low invest.	High invest.
<b>PANAS-X</b>						
Negative Affect	14.08 (4.17) <sup>a</sup>	12.90 (3.50) <sup>b</sup>	13.30 (3.85)	13.76 (3.95)	13.75 (4.39)	13.24 (3.33)
Positive Affect	24.47 (0.85)	25.81 (0.85)	25.82 (0.77)	24.46 (0.93)	24.40 (0.86)	25.87 (0.84)
Assuredness	12.56 (0.51)	13.43 (0.51)	13.32 (0.46)	12.67 (0.56)	12.34 (0.51)	13.64 (0.50)
Fear	8.16 (2.32) <sup>c</sup>	7.62 (2.30) <sup>d</sup>	7.76 (2.37)	8.07 (2.25)	7.92 (2.51)	7.85 (2.14)
Guilt	7.54 (2.55)	7.16 (1.93)	7.03 (2.00) <sup>a</sup>	7.79 (2.54) <sup>b</sup>	7.58 (2.53)	7.13 (1.96)
Hostility	7.69 (2.56) <sup>a</sup>	6.91 (1.48) <sup>b</sup>	7.10 (1.66) <sup>c</sup>	7.58 (2.62) <sup>d</sup>	7.62 (2.58) <sup>a</sup>	6.98 (1.49) <sup>b</sup>
Joviality	17.44 (0.80)	19.33 (0.81)	18.91 (0.73)	17.87 (0.88)	17.95 (0.81)	18.83 (0.80)
Sadness	7.44 (2.98)	6.86 (3.05)	6.90 (2.79)	7.49 (3.29)	6.88 (2.92)	7.42 (3.11)
Serenity	9.10 (2.74) <sup>a</sup>	9.94 (2.76) <sup>b</sup>	9.63 (2.92)	9.38 (2.56)	9.16 (2.97) <sup>a</sup>	9.87 (2.53) <sup>b</sup>
<b>State Self-Esteem Scale</b>						
Appearance	19.98 (4.71)	20.34 (5.06)	22.08 (4.19) <sup>a</sup>	17.51 (4.51) <sup>b</sup>	19.42 (5.14) <sup>a</sup>	20.88 (4.52) <sup>b</sup>
Performance	25.47 (5.36) <sup>c</sup>	26.73 (4.80) <sup>d</sup>	26.80 (4.98) <sup>a</sup>	25.14 (5.18) <sup>b</sup>	25.12 (5.54) <sup>a</sup>	27.05 (4.50) <sup>b</sup>
Social	27.53 (5.07)	28.28 (5.50)	28.78 (5.28) <sup>a</sup>	26.70 (5.10) <sup>b</sup>	27.28 (6.20) <sup>c</sup>	28.52 (4.17) <sup>d</sup>
STA	5.26 (2.02)	5.21 (2.32)	5.02 (1.90)	5.53 (2.47)	5.02 (1.96)	5.44 (2.34)

*Note.* Invest. = investment; PANAS-X = Positive and Negative Affect Schedule-Expanded Form; STA = Stereotype Threat Assessment.

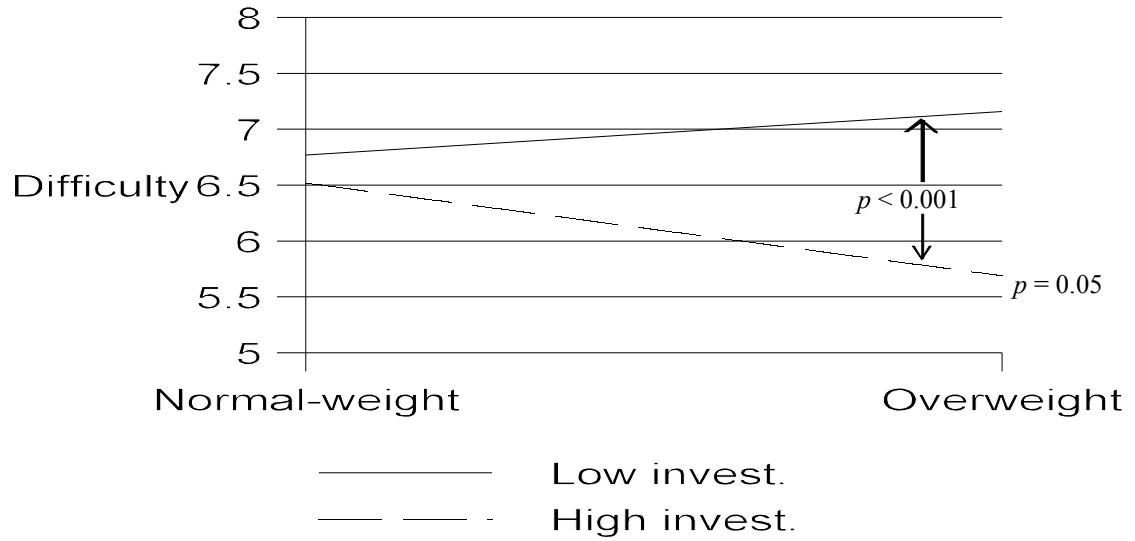
a-b. Significantly different at the 0.05 level in comparisons within each independent variable category.

c-d. Significantly different at the 0.10 level in comparisons within each independent variable category.

On the EPIM, there were significant main effects of academic investment for perceived difficulty of the measure, estimates of problems solved and guessed, and reported effort, motivation, and pressure. Highly invested participants found the measure less difficult, estimated that they had solved more problems and guessed on fewer, reported exerting more effort, and felt more motivation and pressure while working, than did less invested participants.

However, for perceived difficulty of the measure, the main effect of investment was qualified by a significant three-way interaction between threat condition, weight, and academic investment,  $F(2, 154) = 3.81, p = 0.02, \eta^2 = 0.04$ . Simple effects analyses revealed that in the stereotype threat condition and among overweight participants, those who were highly invested perceived the intellectual measure to be less difficult than did those who were less invested,  $F(1, 78) = 16.52, p < 0.001, \eta^2 = 0.15$ . This difference was not present among overweight participants in the control condition ( $p = 0.16$ ). As an alternative way of interpreting this interaction, among highly invested participants in the threat condition, overweight participants found the measure to be less difficult than did normal-weight participants,  $F(1, 79) = 3.81, p = 0.05, \eta^2 = 0.04$ . This difference was not present among highly invested participants in the control condition ( $p = 0.11$ ). Thus, this pattern of results suggests that although highly invested participants generally perceived the measure to be less difficult than did less invested participants, this difference may be primarily due to the lower difficulty perceptions of threatened and highly invested overweight participants. Under conditions of stereotype threat, highly invested overweight participants found the measure to be less difficult than did both less invested

## Stereotype Threat



## Control

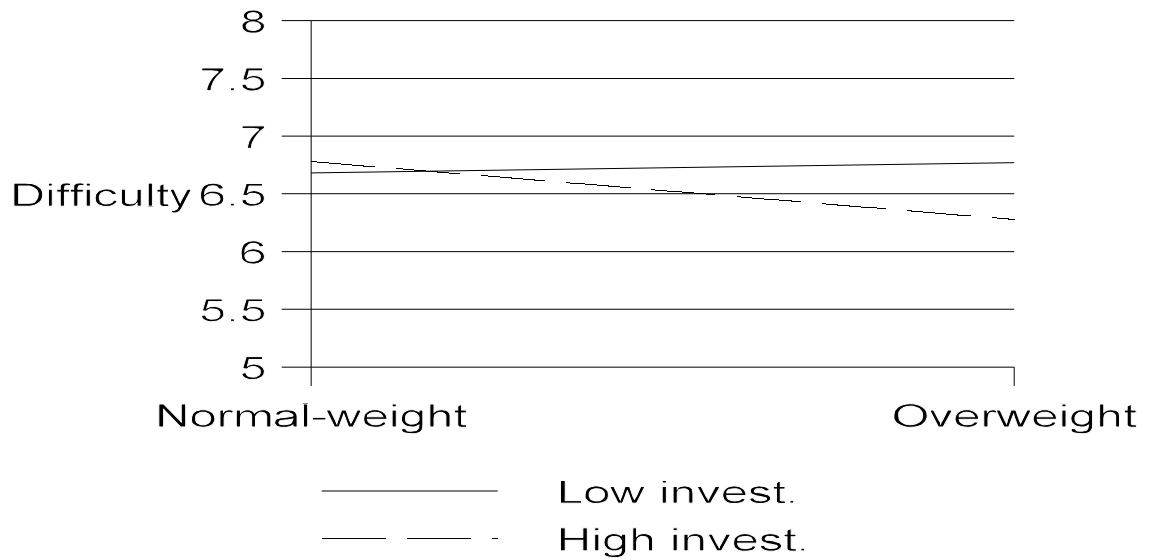


Figure 11. Perceived difficulty of pre-debriefing intellectual measure as a function of experimental condition, subjective weight, and academic investment.

overweight participants, and highly invested normal-weight participants. See Figure 11 for a graph of this three-way interaction.

In addition, for estimates of problems guessed, there was a significant interaction between threat condition and subjective weight,  $F(1, 145) = 5.13, p = 0.02, \eta^2 = 0.03$ . Simple effects analyses indicated that among normal-weight participants, those in the control condition ( $M = 8.93, SD = 6.07$ ) reported guessing significantly more than did those in the threat condition ( $M = 6.04, SD = 4.28$ ),  $F(1, 150) = 7.03, p = 0.009, \eta^2 = 0.04$ . The reported guessing of overweight participants did not differ by experimental condition ( $p = 0.24$ ). However, the above results were qualified by a significant three-way interaction,  $F(2, 145) = 5.88, p = 0.004, \eta^2 = 0.07$ . Simple effects analyses indicated that among normal-weight participants who were less invested, those in the control condition guessed more than did those in the threat condition,  $F(1, 86) = 16.19, p < 0.001, \eta^2 = 0.14$ . Guessing did not differ by experimental condition in normal-weight participants who were highly invested ( $p = 0.83$ )<sup>8</sup>. The opposite pattern was observed among less invested overweight participants, such that those in the control condition guessed less than did those in the threat condition,  $F(1, 61) = 3.84, p = 0.05, \eta^2 = 0.06$ .

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<sup>8</sup>

As displayed in Figure 12, there was also a significant difference among normal-weight participants in the control condition: those low in academic investment guessed more than did those high in investment,  $F(1, 86) = 9.39, p = 0.003, \eta^2 = 0.09$ . The guessing of normal-weight participants either low or high in investment did not significantly differ in the threat condition ( $p = 0.28$ ).



Guessing did not differ by condition in highly invested overweight participants ( $p = 0.81$ )<sup>9</sup>. See Figure 12 for a visual representation of the three-way interaction.

Thus, to briefly summarize, although a two-way interaction between threat condition and weight was found, such that among normal-weight participants, those in the control condition reported guessing more than did those in the threat condition, this difference was present only in less invested normal-weight participants, and not in highly invested ones. Moreover, although the guessing of overweight participants did not generally differ by condition, significant differences were present once academic investment was accounted for. Specifically, among less invested overweight participants but not highly invested ones, those in the control condition guessed less than did those in the threat condition.

*State mood.* For PANAS-X Negative Affect, Hostility, and Serenity, there were significant main effects of stereotype threat condition. Participants in the control condition reported more negative affect and hostility, and less serene feelings, than did participants in the threat condition. For Hostility and Serenity, there were also significant main effects of academic investment, such that highly invested participants were less hostile and more serene than were less invested participants. Moreover, for Guilt, there was a significant main effect of weight, with overweight participants reporting more guilt than did normal-weight participants.

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As is evident in Figure 12, there was also a significant difference among overweight participants in the threat condition: those low in investment reported guessing more than did those high in investment,  $F(1, 61) = 10.18, p = 0.002, \eta^2 = 0.12$ . The guessing of overweight participants either low or high in investment did not significantly differ in the control condition ( $p = 0.43$ ).



In addition, the main effect of experimental condition for Negative Affect was qualified by a significant three-way interaction,  $F(2, 154) = 3.39, p = 0.04, \eta^2 = 0.04$ . A consistent pattern was revealed by simple effects analyses, such that the highest level of negative affect was reported by less invested overweight participants in the control condition. For example, among overweight participants who were less invested, those in the control condition reported more negative affect than did those in the threat condition,  $F(1, 65) = 7.41, p = 0.008, \eta^2 = 0.09$ . This difference was not present in overweight participants who were highly invested ( $p = 0.99$ ). Moreover, among less invested participants in the control condition, those who were overweight reported feeling more negatively than did those who were of normal-weight,  $F(1, 77) = 4.59, p = 0.04, \eta^2 = 0.05$ . The two weight categories did not significantly differ in less invested participants in the stereotype threat condition ( $p = 0.81$ ). See Figure 13 for a graph of this three-way interaction.

The main effects of Hostility were qualified by a significant two-way interaction between threat and weight,  $F(1, 154) = 6.03, p = 0.02, \eta^2 = 0.03$ . Simple effects analyses revealed that only among overweight individuals did participants report more hostility in the control condition ( $M = 8.30, SD = 3.22$ ) than in the threat condition ( $M = 6.76, SD = 1.33$ ),  $F(1, 159) = 8.62, p = 0.004, \eta^2 = 0.05$ . Hostility in normal-weight participants did not significantly differ by experimental condition ( $p = 0.59$ ).

However, this was qualified by a significant three-way interaction,  $F(2, 154) = 3.55, p = 0.03, \eta^2 = 0.04$ . Simple effects analyses revealed a pattern that was identical to that seen for Negative Affect, in that the greatest hostility was endorsed by less invested

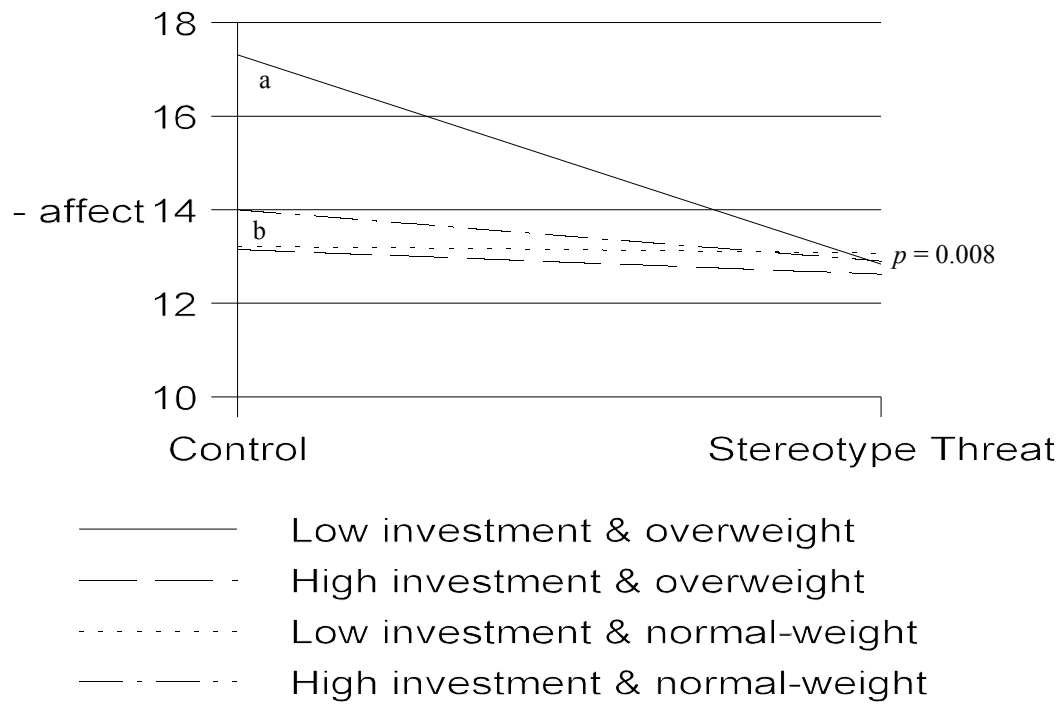


Figure 13. State negative affect as a function of experimental condition, subjective weight, and academic investment. a-b. Significantly different at the 0.05 level.

overweight participants in the control condition. For example, among overweight participants who were less invested, those in the control condition reported more hostility than did those in the threat condition,  $F(1, 65) = 12.35, p = 0.001, \eta^2 = 0.14$ . This difference was not present in overweight participants who were highly invested ( $p = 0.83$ ). Moreover, among less invested participants in the control condition, those who were overweight reported feeling more hostile than did those who were of normal-weight,  $F(1, 77) = 6.32, p = 0.01, \eta^2 = 0.07$ . The two weight categories did not significantly differ in threatened and less invested participants ( $p = 0.77$ ).

Thus, to briefly summarize the results for Hostility, participants in the control condition reported more hostility than did participants in the threat condition. However, greater hostility in the control condition was reported only by overweight participants, and more specifically, by less invested overweight participants. As can be seen in Figure 14, less invested overweight participants in the control condition had the highest hostility scores out of all groups.

*State self-esteem.* There were main effects of weight for Performance, Appearance, and Social self-esteem, such that overweight participants reported lower self-esteem than did normal-weight participants. There were also main effects of academic investment for Performance and Appearance self-esteem, with highly invested participants endorsing higher self-esteem than did less invested participants.

*Feelings of stereotype threat.* On the STA, there were no significant main or interaction effects (all  $ps > 0.18$ ).

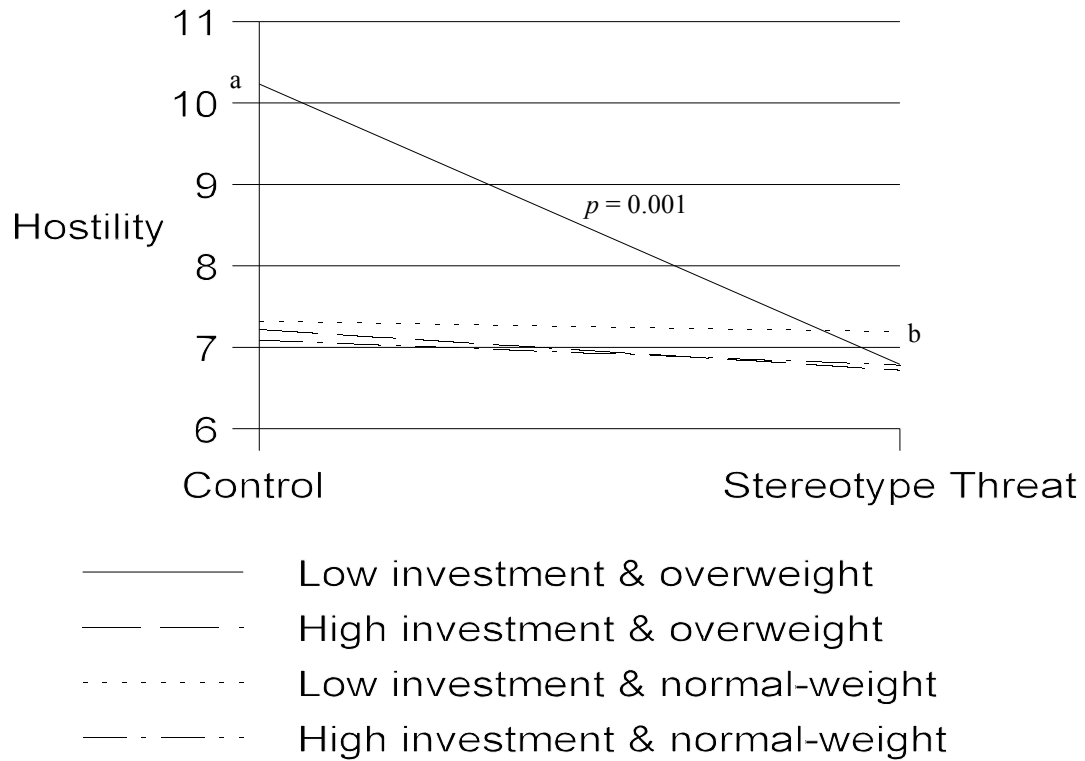


Figure 14. State hostility as a function of experimental condition, subjective weight, and academic investment. a-b. Significantly different at the 0.05 level.

*Performance on intellectual measure from pre- to post-debriefing.* The three-way mixed design ANOVA again revealed only a significant main effect of time,  $F(1, 154) = 4.75, p = 0.03, \eta^2 = 0.03$ , with all participants achieving lower accuracy on the post-debriefing intellectual measure than they did on the pre-debriefing one<sup>10</sup>. Planned comparisons assessing change in performance within each of the eight experimental groups revealed no differences in accuracy between the pre- and post-debriefing measures in each of the groups (all  $ps > 0.06$ ), including highly invested overweight participants in the threat condition.

*Summary of subjective weight results.* Table 20 summarizes the results of the subjective weight analyses. The significant main effects of threat condition and academic investment will not be reviewed here since they were discussed in the objective weight results, and the identical method of definition of these two variables as well as the identical sample sizes in both analyses make these results identical.

Once again, less academically invested normal-weight participants in the control condition performed the least accurately out of all groups. A significant three-way interaction for reported guessing also revealed that this group reported guessing more than did their counterparts in the threat condition. The opposite pattern was found in less invested overweight participants, such that those in threat condition guessed more than did those in the control condition. Significant three-way interactions also were obtained

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The means and standard deviations of performance during the two times were identical to that reported in the objective weight analyses, given that all participants, regardless of method of weight definition, completed the two measures.

Table 20

*Summary of the Subjective Weight Results for Study 2*

Hypotheses	Dependent Variable	Results
Threatened overweight participants would perform significantly worse on an intellectual measure than would unthreatened participants, and normal-weight participants in either condition. The performance of the latter three groups was not expected to differ.	Pre-debriefing intellectual measure -Problems correct -Accuracy	Hypotheses not supported: overweight participants in the threat condition did not perform worse than did any other group.
Highly invested overweight participants in the stereotype threat condition would perform worse than would: (a) highly invested overweight participants in the control condition, (b) lowly invested overweight participants in either condition, and (c) normal-weight participants in either condition, regardless of academic investment. The performance of the other seven groups was not expected to differ.		Hypotheses not supported: highly invested overweight participants in the threat condition did not perform worse than did any other group.

Hypotheses	Dependent Variable	Results
		Less academically invested normal-weight participants in the control condition performed less accurately than did four other groups.
Following debriefing, the performance of threatened and highly invested overweight participants would improve to the level of all other groups.	Post-debriefing intellectual measure -Accuracy	Hypotheses not supported: highly invested overweight participants in the threat condition did not perform better after learning about stereotype threat during debriefing.
		All groups performed less accurately on the post-debriefing intellectual measure as compared to the pre-debriefing one.

Hypotheses	Dependent Variable	Results
None	Experience and Perception of Intellectual Measure -Difficulty -Biassedness -Problems solved -Problems guessed -Effort -Motivation -Pressure	-Main effect of investment: highly invested participants found the measure less difficult, estimated that they had solved more problems and guessed on fewer, reported exerting more effort, and felt more motivation and pressure while working, than did less invested participants. -Three-way interaction: among overweight participants in the threat condition, those who were highly invested perceived the intellectual measure to be less difficult than did those who were less invested. -Three-way interaction: among normal-weight participants who were less invested, those in the control condition guessed more than did those in the threat condition.
	State mood: PANAS-X -Negative Affect -Positive Affect -Assuredness -Fear -Guilt -Hostility -Joviality -Sadness -Serenity	-Main effect of threat condition: unthreatened participants reported more Negative Affect and Hostility, and less Serenity, than did threatened participants. -Main effect of investment: highly invested participants reported less Hostility and more Serenity than did less invested participants. -Main effect of weight: overweight participants reported more Guilt than did normal-weight participants. -Three-way interaction: less invested overweight participants in the control condition reported the highest Negative Affect and Hostility.



Hypotheses	Dependent Variable	Results
None	State self-esteem: SSES -Performance -Appearance -Social	-Main effect of weight: overweight participants reported lower Performance, Appearance, and Social self-esteem than did normal-weight participants. -Main effect of investment: highly invested participants reported higher Performance and Appearance self-esteem than did less invested participants.
	Feelings of stereotype threat: STA	No significant results

*Note.* BDI-II = Beck Depression Inventory–II; PANAS-X = Positive and Negative Affect Schedule–Expanded Form; RSES = Rosenberg Self-Esteem Scale; SSES = State Self-Esteem Scale; STA = Stereotype Threat Assessment.

for mood, and indicated that the most negative and hostile feelings were endorsed by less invested overweight participants in the control condition.

A significant three-way interaction for reported difficulty was also obtained: among overweight participants in the threat condition, those who were highly invested perceived the intellectual measure to be less difficult than did those who were less invested. Finally, self-identified overweight participants reported feeling guiltier, and lower self-esteem across all three measured domains (Performance, Appearance, and Social), than did normal-weight participants.

## **Discussion**

### **Objective weight analyses.**

*Performance on intellectual measures.* It had been hypothesized that objectively overweight participants exposed to a stereotype threat would perform significantly worse on an intellectual measure than would overweight participants unexposed to this threat, and normal-weight participants in either condition, with the latter three groups' performance expected to be equivalent. This hypothesis was not supported, as the performance of threatened overweight participants was not significantly different from that of the other three groups. Instead, all groups performed equivalently, both in terms of number of correct responses, and accuracy of responses.

In addition, it had been hypothesized that academic investment would moderate the threat reaction of overweight individuals, such that highly invested overweight individuals would perform worse when threatened than would all other groups (i.e., highly invested overweight individuals in the control condition, less invested overweight

individuals in either condition, and normal-weight individuals regardless of condition or investment). Again, this hypothesis was not supported, as threatened and highly invested overweight participants performed no worse than did the other groups. Instead, the worst performance was exhibited by less invested normal-weight participants in the control condition, as the accuracy achieved by this group was significantly lower than that of four other groups. In other words, the worst performance was observed in individuals who: (a) did not receive a stereotype threat, (b) were not expected to be affected by a weight-based threat, had one been administered, and (c) may not have been particularly motivated to do well on the intellectual measure regardless of threat, given that academic achievement may not be central to their self-concept.

Moreover, it had been hypothesized that after debriefing, participants who were detrimentally impacted by the threat would perform better on a subsequent intellectual measure, because they would have been familiarized with the effects of stereotype threat. This hypothesis could not be properly assessed given that no evidence of the stereotype threat effect was obtained. Instead, analyses revealed that all participants performed worse on the post-debriefing intellectual measure as compared to the pre-debriefing one. This could have been due to fatigue or decreased motivation. Decreased motivation may have occurred given that participants were aware that this was the final task of the study. Alternatively, they may have cared less about doing well because the ostensible purpose of the post-debriefing measure was not to evaluate aspects of their cognitive functioning (it was presented as a pilot test of items), in contrast to the rationale for the pre-debriefing measure, which was presented as an indicator of problem-solving ability.

To briefly summarize, it would appear that intellectual performance was largely unaffected by threat condition, weight, or academic investment. All participants (with the exception of less invested normal-weight participants in the control condition) performed approximately equally on the pre-debriefing intellectual measure, and the performance of all participants worsened on the post-debriefing one. The fact that group differences were not reflected on the intellectual measures may have been due to their difficulty. In particular, a floor effect may have occurred, such that the performance of all participants was uniformly low. For the pre-debriefing intellectual measure, the interquartile range for number of problems correctly solved was 3, with the middle 50% of responses ranging from 2-5. For the post-debriefing measure, the interquartile range for problems correctly solved was 2, with the middle 50% of responses ranging from 1-3. This indicates that both these measures were challenging.

Alternatively, there may have indeed been few group differences. For example, the absence of differences between the stereotype threat and the control conditions, and overweight and normal-weight participants, may be evidence that general knowledge and/or acceptance of the association between weight and decreased intelligence is weak, such that reading about weight-based discrimination and/or actually being overweight had no impact on intellectual performance. In terms of the former point, this may mean that stereotype threat was not actually experienced by overweight and obese participants, because the stereotype of obese individuals' intellectual inferiority may not have been well-known, recognized, or sufficiently activated. In fact, there were no differences in performance self-esteem between normal-weight and overweight participants, although

this finding must be interpreted with caution since state self-esteem was assessed following both the experimental manipulation and the pre-debriefing intellectual measure.

The lack of performance differences between individuals high and low in academic investment is more surprising, but may indicate that caring about intellectual achievement does not necessarily result in commensurate achievement, at least in this experiment. Whether or not it produces achievement in the outside world (e.g., grades) remains an empirical question. However, highly invested individuals did have a more optimistic evaluation of their performance on the pre-debriefing intellectual measure than did less invested individuals, with the former reporting more confidence and motivation, lower estimates of guessing and higher estimates of problems correct, and perceptions of the measure as less difficult generally.

*Main effects of stereotype threat.* Participants in the threat condition reported less negative affect, hostility, and guilt; more serenity; and higher performance self-esteem, than did participants in the control condition. Although participants' declarations could have reflected genuine improvements in well-being, we are interpreting them as defensively motivated, given that they followed two instances of what were likely ego threats. Ego threats are "events that call into question one's positive self-regard" (vanDellen, Campbell, Hoyle, & Bradfield, 2011, p. 52). They may lead to the use of defensive strategies to restore self-esteem (vanDellen, Campbell, Hoyle, & Bradfield, 2011). Thus, in this study, when participants' self-worth was threatened by the experimental procedures (which are described below), they may have attempted to repair

it by claiming to have felt calmer and more self-confident.

Before expanding on this discussion, it is important to differentiate between stereotype and ego threats, as there was no evidence in Study 2 that the experimental manipulation acted as the former. In particular, neither the self-report nor the behavioural data indicated that reading about weight-based discrimination inspired concern among overweight participants that their intellectual performance could be interpreted in the context of disparaging weight stereotypes.

Instead, there may have been two ego threats in the experimental condition, affecting all participants, that preceded the completion of the mood and self-esteem measures—the vignette on weight-based discrimination, and the pre-debriefing intellectual measure. Regarding the first instance, the vignette may have been an ego threat because it reminded all participants that just like the obese women portrayed, they too deviated from the thin ideal (given that the average woman is larger than the unrealistically thin ideal propagated by the media; Spitzer, Henderson, & Zivian, 1999). Although most participants were not large enough to be mistreated and humiliated in the same manner as the women described, they nevertheless may have feared some ramifications of their thin ideal deviation, such as being perceived as less attractive or desirable (since thinness is often equated with beauty in our current cultural climate; Wiseman, Gray, Mosimann, & Ahrens, 1992). These fears may then have shaken self-esteem. Indirect evidence that reminders about ideal weight deviation decrease self-confidence comes from research on the psychological effects of thin media exposures; in particular, that such exposures decrease self- and body-esteem (Grogan, Williams, & Conner, 1996; Thornton &

Maurice, 1999).

Completion of the pre-debriefing intellectual measure may have been the second ego threat, as the measure was intended to be particularly difficult, and was indeed experienced as such (e.g., the mean perceived difficulty of the measure was 6.61, with 8 representing “extremely difficult”). Moreover, participants afterwards reported that they had been unsuccessful—they estimated having solved an average of 4.77 problems correctly (a 23.85% accuracy rate). Therefore, perceived failure on this measure may have undermined participants’ feelings of intellectual competence. Although this failure would not have equally affected all participants, as not all were strongly invested in academic achievement as a source of self-worth, it is reasonable to assume that all participants, being undergraduate students who enrolled in the study for extra credit, valued intellectual excellence to some extent, and hence felt this part of their identity challenged following the test.

If these two experimental procedures indeed acted as ego threats, experiencing them successively may have challenged participants’ self-esteem enough to necessitate defensive declarations aimed at restoring confidence. We are interpreting the data to indicate that the chosen method was to report calmer mood and improved performance self-esteem, which represents a compensating defensive strategy (vanDellen et al., 2011). The goal of compensating strategies is to alter the interpretation of a current situation (vanDellen et al., 2011). In this instance, participants may have attempted to counter evidence of their deviation from the ideal in two culturally valued domains (appearance and academics; Jarry, Polivy, Herman, Arrowood, & Pliner, 2006) with the impression

that they were untroubled by this information.

*Main effects of weight.* Compared to their normal-weight counterparts, overweight individuals found the pre-debriefing intellectual measure to be less biased, and they also estimated that they had solved more problems correctly on it. These declarations may have once again represented a compensating defensive strategy, which may have been necessitated even in the absence of the experimental manipulation. Instead, given the pervasive idealization of thinness in our culture (Heinberg, 2001), overweight participants may live in a near constant state of self-esteem threat, as the reality of their thin ideal deviation is inescapable even without overt reminders. This, coupled with the additional ego threat of completing the pre-debriefing intellectual measure, may have jeopardized positive self-regard enough to require restorative endeavours. The results show that such endeavours focussed on perceptions of the pre-debriefing intellectual measure. Specifically, by claiming that the measure was fair and that they did well on it, overweight participants could convey that they were intelligent or at least were comfortable with the task, even if they did drastically deviate from the physical beauty ideal.

Moreover, they reported exerting less effort in the threat than in the control condition. If this was an extension of their characteristic defensive motivations, then when confronted in the weight vignette with an overt reminder of the consequences of their thin ideal deviation (i.e., an additional ego threat), overweight participants may have been motivated to engage in further compensatory behaviour by conveying that not only had they found the task reasonable and feasible, they did not have to exert as much effort



to do well on it.

**Subjective weight analyses.**

*Three-way interactions for guessing.*

*In less invested normal-weight participants.* Once more, the hypotheses regarding performance were not confirmed. Instead, the results again showed that less invested normal-weight participants in the control condition exhibited the worst performance. In these analyses, this group's poorer performance may have been attributable to guessing, as a three-way interaction indicated that among less invested normal-weight participants, those in the control condition guessed more than did those in the threat condition.

Although it is beyond the scope of this project to focus on the performance of less invested normal-weight participants; briefly, given that the control condition represented an absence of the experimental manipulation, it can be interpreted that this group guessed more when there were no external influences on their performance. This may have been because they generally depend less on academic achievement as a source of self-definition (Steele, 1997), and thus may not have valued expending additional effort on the measure when they could save time and work by making informed guesses. However, after exposure to the weight discrimination vignette, they may have become concerned that they too could be subjected to similar discrimination if they failed in academic achievement, a valued social domain (Donhardt, 2004). To prevent such an occurrence at least in the immediate setting (i.e., the experiment), they may have altered their behaviour on the intellectual task by guessing less.

*In less invested overweight participants.* The opposite pattern was observed in

less invested overweight participants, such that those in experimental condition guessed more than did those in the control condition. This was also accompanied by mood changes, as significant three-way interactions indicated that the most negative and hostile feelings were endorsed by less invested overweight participants in the control condition. In other words, it would appear that in the experimental condition, less invested overweight participants guessed more than if they were in the control condition, but also felt less negatively as a result. Of course, given that state mood was assessed following both the experimental manipulation and the pre-debriefing intellectual measure, it is impossible to attribute the mood findings to either of these experimental phases alone, or to their combination.

In fact, it may have been precisely this combination that led to the claims of increased guessing and improved mood. As previously suggested, these two experimental phases may have acted as ego threats that necessitated defensive tactics. The use of mood as a compensating defensive strategy has already been discussed in the objective weight discussion, and the same mechanism is proposed to have occurred here. The claims of increased guessing may have reflected a different defensive strategy—breaking. Breaking occurs when individuals lower expectations for themselves following an ego threat, thus removing the apprehension of receiving unexpected and unfavourable information about the self (vanDellen et al., 2011). In the present instance, less invested overweight participants may have reported greater guessing as a way to anticipate poor performance on the intellectual measure. Moreover, claims of guessing may have allowed them to attribute potential failure to their approach to the measure,

rather than to intrinsic intellectual inferiority.

***Three-way interaction for difficulty.*** There was also a significant three-way interaction for perceived difficulty, such that among overweight participants in the threat condition, those who were highly invested perceived the intellectual measure to be less difficult than did those who were less invested. Again, we are interpreting these declarations as a compensating defensive strategy, given that they followed two overt ego threats. The strategy in this instance may have been for this group to claim that they found an intentionally difficult measure to be accessible.

***Summary.*** As was found in the objective weight analyses, participants in the experimental condition generally reported better mood (specifically, less negative affect and more serene feelings) than did participants in the control condition. Thus, once again, all participants in the former condition may have felt an attack on their self-esteem from two successive ego threats, and used self-reported mood to compensate defensively. Among threatened overweight participants specifically, their defensive efforts appeared to vary depending on whether or not academic achievement was a source of self-worth. Specifically, less invested overweight individuals seemed to pursue protection through the defence of breaking, by reporting greater guessing; while highly invested ones may have attained the same goal through compensation, by reporting decreased perceptions of the difficulty of the measure. These different strategies may have been related to degree of academic investment, as it may have been important for the latter group but not the former to use an approach that would convey academic competence.

**Comparisons between objective and subjective weight results.** Comparisons of

the results obtained with both methods of weight definition revealed that in both analyses, the worst performance on the pre-debriefing intellectual measure was exhibited not by highly academically invested overweight participants in the threat condition, as had been predicted, but by less invested normal-weight participants in the control condition, the exact opposite of the prediction. A possible mechanism for this reduced accuracy was revealed in the subjective weight analyses, which showed that this group reported having guessed more than did their threatened counterparts. This finding was indicative of a larger trend, such that three-way interactions were only obtained when weight was subjectively defined. This may indicate that while differences in behaviour were detected regardless of the method of weight definition, only self-perceived weight status was sensitive enough to interact with another self-reported attribute (academic investment) and experimental condition to reveal between-group discrepancies in declared experience of the intellectual measure.

In contrast, only with an objective definition were main effects of weight obtained for such declarations. Specifically, objectively overweight participants found the measure to be less biased, and estimated having solved more problems correctly on it, than did normal-weight participants. We interpreted this as an example of the general tendency of the former to defensively self-enhance. A key difference between the objectively and the subjectively overweight groups was that the former was partially comprised of individuals who did not consider themselves to be overweight despite their BMI (and thus their exclusion from the self-reported overweight category). Therefore, their drive to self-protect may have been powerful enough to engender both inaccurate

self-categorizations of weight, as well as defensive declarations in the absence of overt ego threats (for participants in the control condition).

However, following the experimental manipulation, all overweight participants, regardless of method of weight definition, made assertions that can be considered defensively motivated. In fact, because the data was more consistent with defensive behaviour, we hypothesized that the stereotype threat condition was actually experienced as two successive ego threats (the vignette on weight-based discrimination and the pre-debriefing intellectual measure) that necessitated defensive protection. In the objective weight analyses, we interpreted reports of decreased effort as a compensatory defence to convey the impression of a relaxed attitude while completing the measure; while in the subjective weight analyses, the chosen strategy and subsequent declarations may have differed in less invested (breaking with professions of greater guessing) and highly invested (compensation with claims of less perceived difficulty) overweight participants.

This pattern also appeared in all participants more generally, and across both sets of analyses, such that all participants in the experimental condition presented reactions that we interpreted as defensive (declarations of improved mood and self-esteem), and which we attributed to the presence of the two aforementioned ego threats. Finally, given that no evidence of the stereotype threat effect was obtained in either analyses, the hypothesis that academic investment would moderate the reactions of the targeted group could not be properly tested.

## Chapter IV

### **General Discussion**

The purpose of this research was to examine the impact of stereotype threat, i.e., the apprehension that one's actions will be judged as confirming group stereotypes, on overweight and obese undergraduate female students. Eating and intellectual performance were the two chosen behaviours of interest, as both are targeted in stereotypes about the obese (lack of control and poor intellectual ability respectively). Moreover, in both studies, identification with a related domain (appearance and academic achievement respectively) was examined as a moderator, as previous research has shown that among a targeted group, highly identified individuals are the most vulnerable to behaving in a stereotypical manner after having been threatened.

It was generally hypothesized that when weight-based stereotypes were activated, overweight and obese participants would display stereotype-consistent behaviour, and that these behaviours would be most pronounced in highly invested individuals. In Study 1, which examined eating, some evidence for the stereotype threat effect was obtained, as both the objective and the subjective weight analyses revealed that overweight participants ate more in the threat than in the control condition. Appearance investment did not moderate this relationship. Moreover, the meaning of this difference was elucidated in the subjective weight analyses: because overweight participants appeared to characteristically restrict their eating, the disinhibitory effect of stereotype threat simply increased their consumption to the amounts eaten by their normal-weight counterparts, whose eating was unaffected by the experimental manipulation. Study 2 examined

intellectual performance, and did not find any evidence of the stereotype threat effect among overweight participants. In fact, across both the objective and the subjective weight analyses, the worst performance was observed in the control condition, and among normal-weight individuals who were low in academic investment. Moreover, the most consistent finding in Study 2 was the defensive declarations of all participants in the experimental condition, which we attributed to the ego-threatening combination of the weight stigmatization vignette and the pre-debriefing intellectual measure.

### **Interpreting Results Within the Process Model of Stereotype Threat**

In an effort to explain and consolidate the plethora of research on the behavioural effects and mechanisms of stereotype threat, Schmader et al. (2008) proposed an integrated process model. The model firstly proposes that stereotype threat arises because of a perceived imbalance between three activated concepts—the self, the group, and the identified domain. Specifically, environmental cues suggest that the group is deficient in the domain and that the targeted individual belongs to the group; imbalance arises because the individual resists the proposition that he or she must then also be deficient. Instead, there is belief in one's ability, or at least a motivation to demonstrate it. The state of imbalance that results, as well as the drive to resolve it, then disrupts working memory or executive control via three mechanisms—physiological arousal, self-monitoring, and suppression of negative thoughts and affect. Schmader et al. hypothesized that it is this disrupted working memory that accounts for the performance deficits that are the foundation of the stereotype threat effect, at least for tasks that require effortful processing. For tasks that are more automatic in nature, they proposed that the

self-monitoring evoked by cognitive imbalance interferes with the otherwise unmediated nature of these tasks, which consequently impedes performance.

**Study 1.** Eating, the behavioural dependent variable in Study 1, is generally an automatic task that is relatively cognitively unmediated; however, the eating style of overweight participants in this study appeared to have been under conscious cognitive control, as evidenced by their restraint in the control condition. Under stereotype threat, their effortful restraint appeared to have been temporarily disrupted such that they ate as much as did normal-weight participants. Thus, the impact of stereotype threat on overweight individuals' eating may have more closely resembled Schmader et al.'s descriptions of effortful rather than routine tasks, since the threat disrupts deliberate processing in both instances. Therefore, the same aspects of the process model that applies to cognitively mediated tasks may also apply here.

Specifically, threat-induced self-monitoring and emotional suppression, both of which are proposed to disrupt executive control, may be most relevant. Regarding the former, Schmader and colleagues (2008) suggested that stereotype threat engenders a need in individuals to monitor their environments and themselves to: (a) gather information to resolve the cognitive imbalance created by the threat, and (b) detect, and thus hopefully avoid, failure. This monitoring uses working memory resources that would otherwise be allocated to successful task completion.

Applied to Study 1, it may be that in the absence of external disruptions (i.e., in the control condition), overweight participants carefully controlled the amounts they ate during the candy taste test. Under conditions of threat however, they may have been



more attentive to other stimuli, such as signs of overconsumption, or their fears of confirming the stereotype. These efforts may have then consumed enough cognitive resources to distract from their characteristic vigilance so that they ironically did eat more. However, far from the stereotype of unconstrained overindulgence, this distraction resulted in only slight increases in intake (a difference of approximately 15 candies between the threat and control conditions). This may indicate that the threat-induced self-monitoring loosened but did not entirely eliminate cognitive restraint.

In terms of emotional suppression, Schmader et al. (2008) noted that the conflicting data on the affective experience of stereotype threat may be evidence of participants' efforts to deny said experience. In Study 1, if the experience of threat is assumed to be negative, evidence for suppression was obtained in both the objective and the subjective weight analyses: in the former, the mood of threatened overweight participants was not different from that of any other groups', while in the latter, their efforts may have been effective enough to actually diminish their fear and hostility. Suppression may have again consumed cognitive resources that would otherwise have been spent monitoring intake.

Study 1 was the first known study to demonstrate the disruptive effects of stereotype threat on a behaviour that is typically inhibited by the targeted group<sup>11</sup>. As such, it may also be the first study to use elements of the process model to account for disinhibitory behaviour following a threat. The process model is also consistent with the

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Although previous research has demonstrated that stereotype threat weakens self-control in general (e.g., Inzlicht, McKay, & Aronson, 2006; Inzlicht & Kang, 2010).

literature on disinhibited eating in restrained eaters, which is relevant since the eating of overweight participants in the control condition suggested characteristic restrained eating, and overweight participants had significantly higher total scores on the Revised Restraint Scale than did normal-weight participants. Research has shown that restrained eaters break their restraint and eat when their self-regulatory resources have been depleted by a task that also required self-regulation (Kahan, Polivy, & Herman, 2003; Vohs & Heatherton, 2000), and also when their attention is directed towards a demanding cognitive task, presumably distracting from intake monitoring (Ward & Mann, 2000). Since self-regulation and attention both depend on executive control, both the restraint literature as well as the present study may indicate that individuals who willfully restrain their eating are susceptible to lapses in self-control whenever their executive efforts are directed elsewhere, including by stereotype threats.

**Study 2.** In Study 2, no evidence was obtained for the stereotype threat effect, and this can also be accounted for with the process model. Specifically, a state of imbalance may not have existed; thus, stereotype threat was not experienced. Recall that imbalance is typically created when targeted individuals feel both identified with a group and invested in demonstrating their ability; however, stereotype threat conveys that group members are deficient in that ability. In this instance however, the latter proposition—that overweight individuals lack intellectual aptitude—may not have been known as a stereotype; or even if it had existed, it may not have been sufficiently activated. Thus, participants could experience affiliation with their weight group without feeling that this would be incompatible with demonstrations of intellectual competence.

### **On Intellectual Inferiority as a Weight-Based Stereotype**

The proposition that the stereotype of overweight individuals' intellectual inferiority may not have existed was informally confirmed via the self-reports of some participants, who expressed surprise at learning of this stereotype during debriefing. Thus, since stereotypes are defined as consensual beliefs about group characteristics (Gardner, 1994), our study may show that the belief that obese individuals lack intellectual ability does not exist within our collective understanding. Its inclusion as a stereotype was based on research that showed that the obese are rated negatively on a number of different attributes, including intelligence (e.g., Butler et al., 1993; Musher-Eizenman et al., 2004; Schwartz et al., 2003). However, rather than revealing stereotypes as some researchers had interpreted (e.g., Butler et al., 1993, Musher-Eizenman et al., 2004), our findings may instead show that these ratings reflect affective evaluations of this group.

Prejudice is hypothesized to be composed of three components—*affective, cognitive, and behavioural* (Maio, Haddock, Manstead, & Spears, 2010). Affective evaluations can be distinguished from stereotypes, since only the latter are comprised of beliefs (Greenwald & Banaji, 1995), and specifically, of beliefs shared by most individuals in a society (Gardner, 1994). Affective evaluations may impact judgments about a group, without these judgments formally manifesting as stereotypes. For example, individuals who are attractive are deemed to possess more desirable personality traits, and are believed to lead more successful lives, than do unattractive individuals (i.e., a halo effect, Dion, Berscheid, & Walster, 1972), although not all of these evaluations

may be actual stereotypes.

Applying this discussion to obesity and intelligence, it may be that previous studies showing low ratings of obese individuals on various qualities, including intellectual ability, may reflect affective evaluations rather than stereotypes. The former, termed fat phobia or anti-fat bias by some researchers (Robinson, Bacon, & O'Reilly, 1993; Teachman, Gapinski, Brownell, Rawlins, & Jeyaram, 2003), may consist of a tendency to ascribe negative qualities to the obese (possibly a reverse halo effect; Greenwald & Banaji, 1995), without all of these necessarily translating into formal stereotypes. It may be that the stereotype threat effect is only activated with the latter.

Given the distinction between prejudicial attitudes and beliefs, further work should be conducted to identify the latter (i.e., stereotypes). Thus far, the extant research on obese stereotypes—which generally uses experimenter generated stimuli such as ratings on semantic differential scales, Likert-scale measures, and Implicit Association Tests (e.g., Chambliss et al., 2004; Foster et al., 2003; Magliocca, Jabero, Alto, & Magliocca, 2005; Robinson et al., 1993; Smith, Schmoll, Konik, & Oberlander, 2007; Teachman et al., 2003)—may be more conducive to identifying global affective evaluations.

Determining stereotypes may necessitate qualitative research; for example, participants may record stereotypes they hold about the obese, and these may then be analysed to identify recurrent or common themes. Butler et al. (1993) conducted one such study, whereby they had participants provide one-word adjectives to a line drawing and written description of different physiques, including endomorphs. Synonymous descriptors were then grouped. The most frequent descriptors of endomorphs were: introverted, insecure,

and lazy. In addition, Gardner (1993) described methods that require participants to provide responses such as ratings and probabilities to experimenter-generated stimuli, and these are then statistically analysed to determine stereotypes.

Alternatively, the stereotype of inferior intelligence may indeed exist, but it may be less centrally associated with overweight and obesity. As such, a stronger experimental manipulation may have been needed to activate it, as well as the behaviours that may follow its activation and that are the hallmark of stereotype threat. Evidence supporting the existence of this stereotype, as well as its peripheral nature, comes from a validation study of the Fat Phobia Scale (Robinson et al., 1993). Factor analyses did reveal a factor reflecting Stupidity and Uncreativity; however, it was the least reliable of the six factors identified, and it was rated the second least stereotypical of the obese.

A stronger experimental manipulation may have made participants feel more affiliated with overweight and obese individuals, and thus more fearful that their actions would be judged by this group's stereotypes. The present experimental manipulation may have failed to evoke fears of weight-related stigmatization in the overweight and obese group because the mean BMI of this group was 30.12 (just above the obese range), which makes it unlikely that the average overweight participant was large enough to experience the severity of discrimination chronicled in the target excerpt. Consequently, they may have been able to detach from the challenges of deviating from the thin ideal, and as such, weaker obesity stereotypes such as the one of unintelligence may not have been activated. Future studies should include manipulations that elicit association with overweight individuals specifically, such as vignettes describing weight-related teasing

(Aubie & Jarry, 2009; Carr, Jaffe, & Friedman, 2008), or rejection from romantic partners because of weight (Sitton & Blanchard, 1995; C. A. Smith et al., 2007). Representations such as these still illustrate the consequences of departing from the thin ideal, even if the divergence is not extreme.

In addition, a more targeted experimental manipulation explicitly referring to intellectual inferiority in the overweight and obese may have been more evocative. Instead, it appeared that the manipulation, perhaps in conjunction with the intellectual measure, instilled in all participants, rather than in just obese ones, a fear of appearing unintelligent. In contrast, in Study 1, the relationship between the targeted group (obese individuals) and the expected stereotypical behaviour (eating) was more explicitly highlighted by the vignette, since the humiliation of the obese may be seen as justified if the stereotype of their overindulgence is accurate. To achieve the same effect in Study 2, a vignette that underscored the association between intellect and obesity may have been necessary. However, it must be noted that previous studies have successfully used manipulations that highlight the social identity of the targeted group, rather than the relationship between the group and the stereotype (e.g., having females complete a math test in a room where they are outnumbered by males; Inzlicht & Ben-Zeev, 2000). It may be that for stereotypes that are less centrally associated with a group, a more explicit manipulation is necessary. Of course, it remains to be empirically determined whether the above two suggestions would indeed be more effective in evoking stereotype threat and its associated behavioural consequence of impaired intellectual performance than would the manipulation used in the present research.

Therefore, the experimental manipulation appeared to have a differential effect in Studies 1 and 2. In the former, it acted as a stereotype threat for overweight participants and a benign influence for normal-weight participants; and in the latter, there was more evidence for it serving as an ego threat for all participants. These divergent effects may have been attributable to what concerns were evoked by the weight discrimination vignette, perhaps in conjunction with the task that immediately followed it. In Study 1, the vignette may have acted according to our intentions—i.e., it inspired concern in overweight participants of being judged according to weight-based stereotypes, especially since it was paired with eating, a task that could provide a salient opportunity to confirm such stereotypes. In Study 2, the vignette, or the vignette in combination with the intellectual measure, may have acted as ego threats that targeted all participants, and not just overweight and obese ones.

### **Practical Applications**

This section will focus on the practical applications stemming from the Study 1 results, since the stereotype threat effect was demonstrated only in this study. The finding that overweight and obese individuals behaved more stereotypically by eating more when they were apprehensive of being judged as lacking self-control can inform efforts to reduce weight-related stigma through education about the uncontrollable factors contributing to obesity. Past educational efforts have focussed on the role of genetics and biology, with some success in decreasing negative attitudes and blaming (Crandall, 1994; K. S. O'Brien, Puhl, Latner, Mir, & Hunter, 2010; Puhl, Schwartz, & Brownell, 2005). The results of the present study extend these uncontrollable factors to also implicate the

social environment, and specifically, weight-related stereotypes. This factor is unique in that although the targets of educational efforts (i.e., the general public) can do nothing about the genetic and biological mechanisms of obesity, stereotypical beliefs are within their control, and may be modified with increased awareness and motivation.

Our results may also increase the efficacy of interventions that attempt to evoke empathy to decrease weight-related stigma. Empathy-based interventions have generally been ineffective in reducing either implicit or explicit anti-fat bias (e.g., Gapinski, Schwartz, & Brownell, 2006; Teachman et al., 2003). Previous studies have attempted to elicit empathy through vignettes that portray the social and affective difficulties of being obese, to little avail. The results of this study may be used to increase the poignancy of these interventions: for example, the stereotype threat effect illustrates the hopeless predicament that obese individuals face if the current state of affairs persists—e.g., they are negatively stereotyped, which increases eating despite their efforts to restrict, which in the long-term may increase their weight so that they are even more salient targets of stereotyping. Attitudinal and behavioural change may be facilitated with the awareness that the most effective way to cease this vicious cycle is to combat weight-related stigmatization and discrimination.

Finally, the above interventions may be useful for overweight and obese individuals themselves, given that they often internalize negative attitudes and beliefs about their weight group, and by extension, about themselves (Puhl, Moss-Racusin, & Schwartz, 2007; Teachman et al., 2003). Moreover, contrary to normal-weight individuals, they have been found to respond to empathy-based interventions (Teachman



et al., 2003). Therefore, education about the numerous determinants of their eating can reduce self-blame and foster greater self-compassion for the challenges presented by the pervasive and insidious nature of weight-based stigmatization. Previous research also has shown that education about the stereotype threat effect can eliminate it (e.g., Johns, Schmader, & Martens, 2005). If this can be established for overweight individuals' eating, then education may promote eating that is responsive to internal rather than to external cues.

### **Limitations and Future Directions**

**General.** One limitation of the present research was its exclusive use of a female sample. Although this was intended since females experience greater pressure to be thin and more weight-based stigmatization than do males (Chen & Brown, 2005; Regan, 1996), it does limit the generalizability of our findings to women. Therefore, future research is needed to determine what overweight and obese men experience in reaction to stereotype threat.

Another sampling limitation was the exclusive recruitment of undergraduate students, which leads to some caution when applying the present results to the general population. One consequence of employing an undergraduate sample was that overweight status appeared to depend on age, as in both Studies 1 and 2, objectively overweight participants were significantly older than were objectively normal-weight participants. In other words, in younger populations such as this one, the incidence of overweight and obesity may be so low that heavier participants are recruited primarily among older individuals. In neither of the studies did age vary by experimental

condition; nevertheless, future research should sample from a wider demographic so as to minimize age discrepancies between different weight categories.

Moreover, as noted throughout the above discussions, the timing of the state mood and self-esteem measures after both the stereotype threat manipulation and the performance component makes it impossible to attribute the psychological findings to either experimental phase alone. The rationale for administering these measures following both phases was to maximize the possibility that feelings of threat would impact behaviour, and thus we eliminated any intervention between the threat administration and the behaviour of interest. However, future research should randomize the placement of the self-report measures either immediately following the threat or after both the threat and the behaviour so as to: (a) provide a more precise assessment of the emotional consequences of stereotype threat, and (b) determine if timing indeed affects self-reported status.

In addition, groups were unequal in all analyses, although the method employed to calculate ANOVA sums of squares is robust to differences in group  $n$ 's. Scarcity of some groups may reflect a corresponding phenomenon in the population, making it potentially difficult to recruit more balanced samples. For example, in both the Study 1 objective and subjective weight analyses (and to a lesser extent in Study 2), the smallest group were overweight and obese participants who were low in appearance investment. This may be because the social consequences of deviating from the thin ideal are so aversive that even overweight individuals who initially have little interest in their appearance become invested as a result of efforts to lose weight, or in hopes of compensating to enhance

other aspects of their physical selves.

Finally, given the number of negative characteristics associated with obesity, future research also should examine other behavioural domains to ascertain if they would be impacted by stereotype threat. Of course, as discussed above, domains may be affected only if explicit stereotypes actually exist for them. Therefore, perhaps preliminary research must first be conducted to differentiate general negative attributes from specific stereotypes about the obese.

**Study 1.** Study 1 employed chocolate candies as the stimuli by which eating was assessed, as previous studies have found candy consumption to be sensitive to experimental manipulations (e.g., Aubie & Jarry, 2009). However, the stereotype of poor dietary self-control may apply not only to the amount eaten, which was examined in this investigation, but also to food choices. In particular, since there is a belief that obese individuals consume too much junk food (Chambliss et al., 2004; Rukavina, Li, & Rowell, 2008), the stereotype of poor self-control may specify not only that obese individuals overindulge in food, but that they overindulge in foods that are calorically dense and of low nutritional value. Therefore, stereotype threat may be behaviourally manifested in both quantity consumed, and quality of food choices. For example, threatened overweight individuals may eat more unhealthy foods specifically. This possibility can be investigated in future studies by providing a selection of foods.

While Study 2 included an examination of the behavioural consequences of removing stereotype threat, Study 1 did not. Therefore, this can be investigated in future studies. Potential manipulations include administering another eating task following

debriefing, or adding a third condition that includes information about the effects of stereotype threat between the experimental manipulation and eating.

**Study 2.** Study 2 generally found no group differences in performance on the pre-debriefing intellectual measure. As discussed above, we can only speculate on the reasons for this—perhaps the expected stereotype threat effect did not occur because the stereotype of obese individuals' unintelligence is not robust or because it was insufficiently activated, or perhaps the intellectual task was so difficult that all groups performed equally poorly. Suggestions for future research have already been discussed above to address the first two possibilities. Concerning the last, the use of a less challenging measure could be helpful to allow group differences to emerge.

Moreover, the measure of domain identification used in Study 2 (the Domain Identification Measure) did not assess whether participants' academic investment was accompanied by investment-consistent behaviours or achievements such as time spent studying or marks. Such data would provide quantitative support for participants' self-reports. In contrast, the measure of investment used in Study 1 (the Appearance Schemas Inventory-Revised) did include questions regarding appearance schematic behaviours such as checking one's appearance in the mirror, and may thus have provided a better measure of investment in the targeted dimension.

## **Conclusion**

Stereotype threat has been found to impact the behaviour of individuals who belong to groups for which stereotypes exist. This research was the first to experimentally investigate stereotype threat in overweight and obese females, who are

believed to possess poor self-control of eating as well as inferior intellectual ability. In Study 1, support for the stereotype threat effect was found, as both objective and subjective definitions of weight revealed that under threat, overweight individuals ate more candies than did their unthreatened counterparts. In Study 2, there was more evidence that the experimental manipulation acted as an ego threat (perhaps in conjunction with the pre-debriefing intellectual measure, another ego threat). As such, the manipulation led not to stereotype-consistent behaviour (i.e., inferior intellectual performance), but to defensive declarations in all participants.

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Appendix A

WEIGHT-BASED STIGMATIZATION VIGNETTE

Puhl & Brownell (2001):

Obese individuals can experience problems in public settings, such as restaurants, theaters, airplanes, buses, and trains because of inadequate seat size and inadequate sizes of features such as seat belts....In the case of *Hollowich v. Southwest Airlines*, an obese woman waiting to board a flight was told that she had to buy an additional seat and that she would be escorted off the plane by armed guards if she boarded. She sued the airline for intentionally inflicting emotional distress and discrimination against a disabled person. Similarly, in *Green v. Greyhound*, an obese woman was told to leave the bus because her weight necessitated two seats. After refusing to leave, she was arrested, although the charge of disorderly conduct was dropped and she instead sued Greyhound for emotional distress. Current conditions are consistent with social attitudes that obese people take up more space than they deserve. O'Hara notes that airlines accommodate seating for individuals with wheelchairs and for pregnant women, but obese people are expected to purchase two seats. (pp. 797-798)

Appendix B

DISTRACTOR VIGNETTE #1

“Hybrids: Get Your Motor Runnin,” (2006):

Hybrids have both an electric motor (powered by batteries) and a conventional internal combustion engine. The batteries help power the vehicle and are recharged by capturing energy during braking....Since hybrids require less fuel to operate, they're great for city driving....Although hybrids don't put an end to our dependence on gasoline, they do reduce it....The downside is that hybrids are still relatively pricey to purchase....Of course, increased consumer demand and more competition from other car manufacturers will likely mean lower prices and more choice in the near future....So what about strictly electric cars? Automobile manufacturers have experimented with electric cars for some time, but the road hasn't been smooth. Electric vehicles often can't be driven further than 200 kilometres on a single charge. Batteries must also be recharged, which can take up to eight hours each time, and they must be replaced after a few hundred charges. There are also environmental costs depending on how the electricity that powers the car is generated.

## Appendix C

## DISTRACTOR VIGNETTE #2

Chua (2008):

All human activity produces emissions of carbon dioxide, that big, bad heat-trapping gas that we're spewing out in quantities greater than all the world's forests and oceans can absorb each year. The more polluting your activity..., the more emissions you generate. The growing number of organizations selling carbon offsets are essentially selling peace of mind. Online calculators can help you estimate the amount of carbon dioxide your jetsetting or road-warrior habits are responsible for contributing to the global equation...[They] then figure out the amount of money needed to neutralize an equivalent amount of carbon dioxide from the atmosphere, whether it's through planting a few acres of trees or by funding renewable-energy projects such as wind [and] solar. But these transactions are not without its critics. The naysayers regard carbon offsets as a carte blanche for heavy polluters to do as they please, without making any actual efforts to cut down their own emissions of carbon dioxide.



Appendix D

DISTRACTOR VIGNETTE #3

Transport Canada Urban Transportation Showcase Program (2007):

When it comes to commuting, statistics prove that Canadians are spending more time inside their cars getting to and from work. According to Statistics Canada, in 2005, Canadian commuters spent an average of one hour (63 minutes) each day getting to and from work, up from 54 minutes in 1992. It stands to reason that if Canadians are spending more time on the daily commute, they are spending less time on other things, such as time with family...[The author] John Adams notes that this could be a troubling trend because communities that are car-oriented can foster anonymity...[This] can lead to a break down in trust among neighbours, increase opportunities for crime, and decrease community and political involvement. In contrast, municipalities where people walk more offer greater opportunities for residents to socialize, to be involved in their communities, and to self-police the neighbourhood.

Appendix E

CONTROL VIGNETTE

CTV.ca News Staff (2007):

The director of an animal rescue organization hopes Air Canada will reverse a decision to ban pets from domestic passenger flights. [She says that] many Canadians have no other options for transporting their animals. Canada's largest airline announced Thursday that...dogs, cats and other animals will have to be shipped separately on cargo flights....Liz White, director of the Animal Alliance of Canada, said...."Fifty per cent of people in Canada share their home with pets, many of them travel and some of them have to travel, and to not be able to deliver your animals safely to your next home...is not a good thing." With...tough post-9/11 security measures, Air Canada says more and more bags are being checked and it simply no longer has room for pets in the cargo holds....But White argues that the percentage of people who travel with pets is so small, the airline should be able to make accommodations.



Appendix G

WEIGHT-BASED STIGMATIZATION VIGNETTE – COMPREHENSION

QUESTIONS

1. An obese woman waiting to board a Southwest Airlines plane was informed that she had to buy an additional seat or else she would be escorted off the plane by armed guards. True or false?

Answer: True

2. The obese woman referred to in question 1 sued the airline for:
  - a. Harassment
  - b. Emotional distress and discrimination
  - c. Uttering threats and discrimination
  - d. None of the above

Answer: b

3. Another obese woman who was charged with disorderly conduct after refusing to leave a Greyhound bus was eventually sentenced to 1-month probation. True or false?

Answer: False

4. According to O'Hara, individuals with wheelchairs and pregnant women are also required to pay for the additional space they require on aeroplanes. True or false?

Answer: False

Appendix H

DISTRACTOR VIGNETTE #1 – COMPREHENSION QUESTIONS

1. Hybrids are run by water. True or false?

Answer: False

2. Hybrids are good for city driving because they require less fuel to operate. True or false?

Answer: True

3. What is a downside to hybrid vehicles compared to conventional vehicles?

- a. They are less safe.
- b. They are smaller and thus have less room.
- c. They are more expensive to purchase.
- d. They are more difficult to drive.

Answer: c

4. Electric vehicles often can't be driven further than 200 kilometres on a single charge. True or false?

Answer: True

Appendix I

DISTRACTOR VIGNETTE #2 – COMPREHENSION QUESTIONS

1. Carbon dioxide produced by human activity is entirely absorbed by the world's forests and oceans. True or false?

Answer: False

2. Online calculators calculate: (a) the amount of carbon dioxide your activity produced, and (b) the amount of money needed to neutralize an equivalent amount of carbon dioxide in the atmosphere. True or false?

Answer: True

3. What is one activity that can help neutralize carbon dioxide released into the atmosphere?
  - a. Planting trees
  - b. Smoking less
  - c. Burning garbage
  - d. Picking up litter

Answer: a

4. What is one criticism of carbon offsetting schemes?
  - a. They are too complicated to run properly
  - b. Not enough people are participating
  - c. They allow heavy polluters to do as they please, without making any actual efforts to cut down carbon dioxide emissions
  - d. Online transactions are often not secure

Answer: c

Appendix J

DISTRACTOR VIGNETTE #3 – COMPREHENSION QUESTIONS

1. The average Canadian is spending less time driving to and from work. True or false?

Answer: False

2. According to the paragraph, spending more time in cars takes away time from what other activity?
  - a. Being productive at work.
  - b. Spending time with the family.
  - c. Engaging in higher education.
  - d. Working out at the gym.

Answer: b

3. According to the paragraph, which is NOT a benefit of municipalities where people walk more?
  - a. Allows residents to socialize
  - b. Allows residents to be involved in their communities.
  - c. Allows residents to self-police the neighbourhood.
  - d. Allows for fewer cars on the road.

Answer: d

4. The author John Adams argues that citizens spending more time in their cars is a benefit to society. True or false?

Answer: False



Appendix K

CONTROL VIGNETTE – COMPREHENSION QUESTIONS

1. According to Liz White, approximately what percentage of Canadians have pets in their homes?
  - a. 30%
  - b. 40%
  - c. 50%
  - d. 60%

Answer: c

2. Why does Liz White believe that Air Canada's ban on animals on domestic passenger flights is problematic?
  - a. Many people have no other options for transporting their animals.
  - b. Banning animals will be emotionally distressing to them and their owners.
  - c. Because of the ban, people may be forced to leave their animals at home when they go on vacation, and thus endanger the animals' well-being.
  - d. Revenue for the company will diminish.

Answer: a

3. Air Canada justifies their ban by saying that because more and more bags are being checked, there simply is no longer room for pets in the cargo holds. True or false?

Answer: True

4. In response to Air Canada's reasoning, Liz White responds that the airline should

be able to make accommodations since the percentage of people who travel with pets is so small. True or false?

Answer: True

Appendix L

CONSENT FORM – STUDY 1



CONSENT TO PARTICIPATE IN RESEARCH

Title of Study: Investigation of a Taste-Test Distractor Task for Memory Studies

You are asked to participate in a research study conducted by Karen Ip from the psychology department at the University of Windsor. The results will contribute to a doctoral dissertation project supervised by Dr. Josée Jarry.

If you have any questions or concerns about the research, please feel free to contact Dr. Josée Jarry at 253-3000, ext. 2237, or via email at [jjarry@uwindsor.ca](mailto:jjarry@uwindsor.ca).

PURPOSE OF THE STUDY

Traditional memory studies present individuals with some information to remember, and then have them do a task to distract them from practising the information (i.e., the distractor task) before the memory test. The purpose of this study will be to look at the effectiveness of a new distractor task—a taste test.

PROCEDURES

If you volunteer to participate in this study, we will ask you to do the following things. Firstly, you will complete 2 questionnaires. Then, you will read 4 paragraphs, all on the topic of social issues in transportation. You will respond to 4 comprehension questions (true-false or multiple choice) after reading a paragraph. After reading all paragraphs, you will complete the taste-test distractor task. During this task, you will taste 3 different types of chocolate candies, and make ratings on each one. After, you will complete 7 questionnaires on your eating habits and mood, because these factors will help us see how you responded to the taste test. This will then help us determine the effectiveness of the taste test as a distractor task. Finally, you will recall information from the paragraphs you had read earlier.

The entire study will last approximately 60 minutes and will be completed in one session. Completing the initial 2 questionnaires should take approximately 5 minutes. Reading the 4 paragraphs and responding to the comprehension questions will take 10 minutes. The taste-test distractor task will take another 10 minutes. Completing the rest of the

questionnaires should take approximately 10-15 minutes. Finally, the memory test will take 10 minutes. You will remain in this room for the duration of the study.

#### POTENTIAL RISKS AND DISCOMFORTS

You will be asked a variety of questions which may be personal in nature. A risk associated with this study is the possibility that thinking about these personal issues may raise some psychological and emotional concerns for you. If you have any concerns you wish to discuss, please feel free to contact the Student Counselling Centre at 253-3000, ext. 4616.

#### POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

You will not benefit from the current study other than the opportunity to learn about and contribute to psychological research. The benefit to society is increasing scientific knowledge as to what types of distractor tasks are most effective in memory research.

#### PAYMENT FOR PARTICIPATION

You will not receive any monetary payment for your participation. You will, however, receive 1.5 bonus marks toward a psychology course of your choice, as long as the instructor is providing an opportunity to earn bonus points.

#### CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission. You will be required to put your name only on this consent form. You do not have to put your name on any of the questionnaires you will fill out. The consent forms and the data will be stored separately in locked filing cabinets. The data will be securely stored for up to seven years, after which it will be shredded.

#### PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so. You may exercise the option of removing your data from the study.

#### FEEDBACK OF THE RESULTS OF THIS STUDY TO THE SUBJECTS

Research findings for this study will be available to participants on the University of Windsor REB web site: [www.uwindsor.ca/reb](http://www.uwindsor.ca/reb) on approximately August 2010.

SUBSEQUENT USE OF DATA

This data will be used in subsequent studies.

RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. This study has been reviewed and received ethics clearance through the University of Windsor Research Ethics Board. If you have questions regarding your rights as a research subject, contact: Research Ethics Coordinator, University of Windsor, Windsor, Ontario N9B 3P4; telephone: 519-253-3000, ext. 3948; e-mail [ethics@uwindsor.ca](mailto:ethics@uwindsor.ca).

SIGNATURE OF RESEARCH SUBJECT/LEGAL REPRESENTATIVE

I understand the information provided for the study “Investigation of a Taste-Test Distractor Task for Memory Studies” as described herein. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

---

Name of Subject

---

Signature of Subject

---

Date

SIGNATURE OF INVESTIGATOR

These are the terms under which I will conduct research.

---

Signature of Investigator

---

Date

Appendix M

LETTER OF INFORMATION – STUDY 1



LETTER OF INFORMATION TO PARTICIPATE IN RESEARCH

Title of Study: Investigation of a Taste-Test Distractor Task for Memory Studies

You are asked to participate in a research study conducted by Karen Ip from the psychology department at the University of Windsor. The results will contribute to a doctoral dissertation project supervised by Dr. Josée Jarry.

If you have any questions or concerns about the research, please feel free to contact Dr. Josée Jarry at 253-3000, ext. 2237, or via email at [jjarry@uwindsor.ca](mailto:jjarry@uwindsor.ca).

PURPOSE OF THE STUDY

Traditional memory studies present individuals with some information to remember, and then have them do a task to distract them from practising the information (i.e., the distractor task) before the memory test. The purpose of this study will be to look at the effectiveness of a new distractor task—a taste test.

PROCEDURES

If you volunteer to participate in this study, we will ask you to do the following things. Firstly, you will complete 2 questionnaires. Then, you will read 4 paragraphs, all on the topic of social issues in transportation. You will respond to 4 comprehension questions (true-false or multiple choice) after reading a paragraph. After reading all paragraphs, you will complete the taste-test distractor task. During this task, you will taste 3 different types of chocolate candies, and make ratings on each one. After, you will complete 7 questionnaires on your eating habits and mood, because these factors will help us see how you responded to the taste test. This will then help us determine the effectiveness of the taste test as a distractor task. Finally, you will recall information from the paragraphs you had read earlier.

The entire study will last approximately 60 minutes and will be completed in one session. Completing the initial 2 questionnaires should take approximately 5 minutes. Reading the 4 paragraphs and responding to the comprehension questions will take 10 minutes. The taste-test distractor task will take another 10 minutes. Completing the rest of the

questionnaires should take approximately 10-15 minutes. Finally, the memory test will take 10 minutes. You will remain in this room for the duration of the study.

#### POTENTIAL RISKS AND DISCOMFORTS

You will be asked a variety of questions which may be personal in nature. A risk associated with this study is the possibility that thinking about these personal issues may raise some psychological and emotional concerns for you. If you have any concerns you wish to discuss, please feel free to contact the Student Counselling Centre at 253-3000, ext. 4616.

#### POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

You will not benefit from the current study other than the opportunity to learn about and contribute to psychological research. The benefit to society is increasing scientific knowledge as to what types of distractor tasks are most effective in memory research.

#### PAYMENT FOR PARTICIPATION

You will not receive any monetary payment for your participation. You will, however, receive 1.5 bonus marks toward a psychology course of your choice, as long as the instructor is providing an opportunity to earn bonus points.

#### CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission. You will be required to put your name only on this consent form. You do not have to put your name on any of the questionnaires you will fill out. The consent forms and the data will be stored separately in locked filing cabinets. The data will be securely stored for up to seven years, after which it will be shredded.

#### PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so. You may exercise the option of removing your data from the study.

#### FEEDBACK OF THE RESULTS OF THIS STUDY TO THE SUBJECTS

Research findings for this study will be available to participants on the University of Windsor REB web site: [www.uwindsor.ca/reb](http://www.uwindsor.ca/reb) on approximately August 2010.

SUBSEQUENT USE OF DATA

This data will be used in subsequent studies.

RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. This study has been reviewed and received ethics clearance through the University of Windsor Research Ethics Board. If you have questions regarding your rights as a research subject, contact: Research Ethics Coordinator, University of Windsor, Windsor, Ontario N9B 3P4; telephone: 519-253-3000, ext. 3948; e-mail [ethics@uwindsor.ca](mailto:ethics@uwindsor.ca).

SIGNATURE OF RESEARCH SUBJECT/LEGAL REPRESENTATIVE

I understand the information provided for the study “Investigation of a Taste-Test Distractor Task for Memory Studies” as described herein. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

SIGNATURE OF INVESTIGATOR

These are the terms under which I will conduct research.

---

Signature of Investigator

---

Date



## Appendix N

## DEBRIEFING – STUDY 1

First, I would like to hear from you what you think about what we did today, any impression about this study? [Give participant the time needed to answer, note answers]

If participant says they suspected something about stereotypes or eating, ask them when they started thinking about that and note here:

There is more to this study than I have told you about so far. But before I tell you exactly what it is, I would like to explain why it is necessary for some kinds of psychological studies not to tell people about the purpose of the study at the very beginning. In some kinds of studies, if we tell people what the purpose of the experiment is and what we predict will happen, some participants might deliberately do whatever they think we want them to do, just to help us out and give us the results they think we want. Alternatively, other participants might deliberately do the opposite of what they think we want, maybe to show us that we can't figure them out. In either case, these participants' reactions would not be a good indication of how they might react in a situation in everyday life, when they didn't think they were being studied. This would make the results of the study not very informative. Therefore, can you see why in some studies we can't tell people about the purpose of the study at the beginning, because it would influence the results and make the data invalid? [Pause and give the participants a chance to ask questions or comment].

Now I would like to explain exactly what we are trying to get at in this study. I told you that the purpose of this study was to investigate the effectiveness of a "new" memory distractor task. However, this study was actually interested in investigating an effect called stereotype threat. Briefly, stereotype threat occurs when someone is concerned that what they do will provide evidence confirming a stereotype about their group. Ironically, people who are worried that they will be stereotyped will then behave in a way that is consistent with the stereotype. For example, there is the stereotype that women are not as good as men in math. If a woman experiences stereotype threat before completing a math test, such as by being told that women had previously performed poorer on the test than men had, they will then actually perform poorer on the test. Interestingly, if a woman does not experience stereotype threat, she will do just as well on the test as men. The stereotype threat research shows that stereotypes about groups are not necessarily true, and that some members of a stereotyped group will behave in certain ways because of the pressures of a situation. For example, in the women and math

research, it can be concluded that women are not less competent than men in the area of math; instead, they may sometimes underperform because they think others expect them to.

The purpose of this study was to look at how stereotype threat affects the eating of overweight people. There is the stereotype that people become overweight because they cannot control their eating; however, if the stereotype threat effect can be demonstrated in this group, then another explanation for overeating could be that overweight people eat greater amounts because they think that others expect them to. In the stereotype threat condition, participants read a paragraph about how overweight and obese people are not accommodated for their size in the public arena. We thought that this paragraph would make participants think about eating and stereotypes, and maybe make them concerned that their eating on the candy taste test would confirm the stereotype of overeating. Based on past research, we predicted that this would make them eat more. However, we expected that participants who did not have this concern will not eat more. This research is important because if the stereotype threat effect is shown, this will indicate that there are other factors that influence the eating of overweight people aside from lack of control. This may then help decrease discrimination and stigmatization. In the control condition, our aim was to see how participants reacted without stereotype threat, so participants in this condition did not read a paragraph about discrimination against overweight and obese individuals.

There were three instances during the course of this study where we were required to be deceptive. The first instance was the presentation of the purpose of the study as a memory investigation. Secondly, we were also deceptive about the purpose of the tasks, such as why you read the paragraphs, did the candy taste-test, and completed the questionnaires. Actually, the paragraphs were intended to introduce stereotype threat, and the candy taste-test was intended to measure the amount you ate and not your taste preferences. Thirdly, we were deceptive in not informing you at the beginning of the study of the fact that we would be requesting a measure of your weight and height later on. If we were to inform you of this request at the beginning, it would have compromised the integrity of the study as you would have wondered why we were doing so. I hope you can see why it was important that deception was used in this study. Do you understand why we had to do that? Do you have any questions? [Pause and allow participant to talk about this if they have any concerns or questions].

Did you have any idea that this is what we were looking at in this study? Yes \_\_\_ No \_\_\_

Did you have at any point any suspicion that we were interested in stereotypes or eating?  
Yes \_\_\_ No \_\_\_

If Yes, at what point?

Your participation in research is very important. In a study like this where we didn't give you all the information up front, we want to make sure that you are satisfied

with your participation and that you wish to keep your data in the study. If you tell me now that you do not want your data to be used, we will remove it from our pool of data. Do you want to keep your data in the study, or have it removed? Do you have any questions about that?

Finally, I will have to ask you not to say anything about the true purpose of the study to anyone else. If you told someone else all the things that I just told you, and then they participated in the study themselves, their reactions wouldn't be spontaneous and natural, and their results couldn't be used. So, I would like to ask you not to say anything about the study, other than that you read some paragraphs and filled out some questionnaires. Will you promise me that you will not tell others about the study?

We also want to let you know that we realize that some of the questionnaires we asked you to complete were personal in nature. Some of them might have made you think about past experiences you did not want to think about. Some people might be upset after completing questionnaires, while others will not be upset at all. Both of these responses are perfectly normal. If you have any concerns, I really want to encourage you to discuss your reactions with me, either now or later on. I will give you a way to contact both me and my research advisor. If you would prefer to discuss your reactions to the study with someone else, we will give you a list of resources on and off campus that you may contact.

We hope you found your experience of participating in this study interesting. I would be glad to answer any questions you might have.

Appendix O

FINAL CONSENT FORM – STUDY 1



FINAL CONSENT TO PARTICIPATE IN RESEARCH

Title of Study: Investigation of a Taste-Test Distractor Task for Memory Studies

SIGNATURE OF RESEARCH SUBJECT/LEGAL REPRESENTATIVE

I have been debriefed and I now understand the exact purpose of the study “Investigation of a Taste-Test Distractor Task for Memory Studies.” I maintain my agreement to participate in this study. I have been given a copy of this form.

\_\_\_\_\_  
Name of Subject

\_\_\_\_\_  
Signature of Subject

\_\_\_\_\_  
Date

SIGNATURE OF INVESTIGATOR

These are the terms under which I will conduct research.

\_\_\_\_\_  
Signature of Investigator

\_\_\_\_\_  
Date

Appendix P

WEIGHT/HEIGHT CONSENT FORM

CONSENT STATEMENT

You have just participated in a research study conducted by Karen Ip and Dr. Josee Jarry at the University of Windsor entitled: The Effects of Stereotype Threat on Eating Behaviours.

As a final part of the larger study you have just completed, you have been asked to allow the investigator to obtain a measure of your height and weight, so your body mass index (BMI) can be calculated.

The information you provide the investigator will remain confidential and will be disclosed only with your permission. Any information you provide will be used for research purposes only, which may eventually include publication of a research article.

Taking part in this final portion of the study is completely voluntary. If you do not wish to be weight or have your height measured, you are free to refuse without any penalty or loss of bonus points.

If you are willing to participate in this study and understand all that will be asked of you in participating, please sign your name following this consent statement.

**I hereby acknowledge that, after reading this statement, I am willing to allow the investigator to measure my height and weight. I understand that all information I provide will be used for research purposes only and that confidentiality is assured. I also realize I am free to withdraw from the study at any time without penalty.**

\_\_\_\_\_  
Signature of participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of investigator

\_\_\_\_\_  
Date

## Appendix Q

## EXPERIENCE AND PERCEPTION OF INTELLECTUAL MEASURE

This questionnaire refers to the 20-item measure of problems that you filled out earlier.

1. How difficult did you find the measure?

1	2	3	4	5	6	7	8
Not at all							Extremely
Difficult							Difficult

2. How biased did you find the measure?

1	2	3	4	5	6	7	8
Not at all							Extremely
Biased							Biased

3. How many problems do you think you solved correctly? \_\_\_\_\_

4. How many problems do you think you guessed on? \_\_\_\_\_

5. How much effort did you put into completing the measure?

1	2	3	4	5	6	7	8
No							Maximal
Effort							Effort

6. How motivated were you to do well on the measure?

1	2	3	4	5	6	7	8
Not at all							Extremely
Motivated							Motivated

7. How much pressure did you feel while completing the measure?

1	2	3	4	5	6	7	8
No							Extreme
Pressure							Pressure

8. How confident are you that you did well on the measure?

1	2	3	4	5	6	7	8
Not at all							Extremely
Confident							Confident





Appendix S

CONSENT FORM – STUDY 2



CONSENT TO PARTICIPATE IN RESEARCH

Title of Study: The Impact of Problem-Solving Strategies and Personality on Memory

You are asked to participate in a research study conducted by Karen Ip from the psychology department at the University of Windsor. The results will contribute to a doctoral dissertation project supervised by Dr. Josée Jarry.

If you have any questions or concerns about the research, please feel free to contact Dr. Josée Jarry at 253-3000, ext. 2237, or via email at [jjarry@uwindsor.ca](mailto:jjarry@uwindsor.ca).

PURPOSE OF THE STUDY

The purpose of this study is to investigate the influence of problem-solving strategies and personality on an individual's memory.

PROCEDURES

If you volunteer to participate in this study, we will ask you to do the following things. Firstly, you will complete 2 questionnaires. Secondly, you will read 4 paragraphs, all on the topic of social issues in transportation. You will respond to 4 comprehension questions (true-false or multiple choice) after reading a paragraph. After reading all the paragraphs, you will complete 20 paper-and-pencil problems. Fourthly, you will complete 6 questionnaires. Fifthly, you will recall information from the paragraphs you had read earlier. Finally, you will complete 10 more paper-and-pencil problems to help pilot items for a future study.

The entire study will last approximately 120 minutes and will be completed in one session. Reading the 4 paragraphs and responding to the comprehension questions will take 10 minutes. The first set of problems will take 20 minutes. Completing the questionnaires should take approximately 10-15 minutes. The memory test will take 10 minutes. Finally, the second set of problems will take 10 minutes. You will remain in this room for the duration of the study.

POTENTIAL RISKS AND DISCOMFORTS

You will be asked a variety of questions which may be personal in nature. A risk associated with this study is the possibility that thinking about these personal issues may raise some psychological and emotional concerns for you. If you have any concerns you wish to discuss, please feel free to contact the Student Counselling Centre at 253-3000, ext. 4616.

#### POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

You will not benefit from the current study other than the opportunity to learn about and contribute to psychological research. The benefit to society is increasing scientific knowledge as to what types of factors influence memory.

#### PAYMENT FOR PARTICIPATION

You will not receive any monetary payment for your participation. You will, however, receive 2 bonus marks toward a psychology course of your choice, as long as the instructor is providing an opportunity to earn bonus points.

#### CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission. You will be required to put your name only on this consent form. You do not have to put your name on any of the questionnaires you will fill out. The consent forms and the data will be stored separately in locked filing cabinets. The data will be securely stored for up to seven years, after which it will be shredded.

#### PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so. You may exercise the option of removing your data from the study.

#### FEEDBACK OF THE RESULTS OF THIS STUDY TO THE SUBJECTS

Research findings for this study will be available to participants on the University of Windsor REB web site: [www.uwindsor.ca/reb](http://www.uwindsor.ca/reb) on approximately August 2010.

#### SUBSEQUENT USE OF DATA

This data will be used in subsequent studies.

RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. This study has been reviewed and received ethics clearance through the University of Windsor Research Ethics Board. If you have questions regarding your rights as a research subject, contact: Research Ethics Coordinator, University of Windsor, Windsor, Ontario N9B 3P4; telephone: 519-253-3000, ext. 3948; e-mail ethics@uwindsor.ca.

SIGNATURE OF RESEARCH SUBJECT/LEGAL REPRESENTATIVE

I understand the information provided for the study “The Impact of Problem-Solving Strategies and Personality on Memory” as described herein. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

\_\_\_\_\_  
Name of Subject

\_\_\_\_\_  
Signature of Subject

\_\_\_\_\_  
Date

SIGNATURE OF INVESTIGATOR

These are the terms under which I will conduct research.

\_\_\_\_\_  
Signature of Investigator

\_\_\_\_\_  
Date

Appendix T

LETTER OF INFORMATION– STUDY 2



LETTER OF INFORMATION TO PARTICIPATE IN RESEARCH

Title of Study: The Impact of Problem-Solving Strategies and Personality on Memory

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If you have any questions or concerns about the research, please feel free to contact Dr. Josée Jarry at 253-3000, ext. 2237, or via email at [jjarry@uwindsor.ca](mailto:jjarry@uwindsor.ca).

PURPOSE OF THE STUDY

The purpose of this study is to investigate the influence of problem-solving strategies and personality on an individual's memory.

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The entire study will last approximately 120 minutes and will be completed in one session. Reading the 4 paragraphs and responding to the comprehension questions will take 10 minutes. The first set of problems will take 20 minutes. Completing the questionnaires should take approximately 10-15 minutes. The memory test will take 10 minutes. Finally, the second set of problems will take 10 minutes. You will remain in this room for the duration of the study.

POTENTIAL RISKS AND DISCOMFORTS

You will be asked a variety of questions which may be personal in nature. A risk associated with this study is the possibility that thinking about these personal issues may raise some psychological and emotional concerns for you. If you have any concerns you wish to discuss, please feel free to contact the Student Counselling Centre at 253-3000, ext. 4616.

#### POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

You will not benefit from the current study other than the opportunity to learn about and contribute to psychological research. The benefit to society is increasing scientific knowledge as to what types of factors influence memory.

#### PAYMENT FOR PARTICIPATION

You will not receive any monetary payment for your participation. You will, however, receive 2 bonus marks toward a psychology course of your choice, as long as the instructor is providing an opportunity to earn bonus points.

#### CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission. You will be required to put your name only on this consent form. You do not have to put your name on any of the questionnaires you will fill out. The consent forms and the data will be stored separately in locked filing cabinets. The data will be securely stored for up to seven years, after which it will be shredded.

#### PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so. You may exercise the option of removing your data from the study.

#### FEEDBACK OF THE RESULTS OF THIS STUDY TO THE SUBJECTS

Research findings for this study will be available to participants on the University of Windsor REB web site: [www.uwindsor.ca/reb](http://www.uwindsor.ca/reb) on approximately August 2010.

#### SUBSEQUENT USE OF DATA

This data will be used in subsequent studies.

RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. This study has been reviewed and received ethics clearance through the University of Windsor Research Ethics Board. If you have questions regarding your rights as a research subject, contact: Research Ethics Coordinator, University of Windsor, Windsor, Ontario N9B 3P4; telephone: 519-253-3000, ext. 3948; e-mail [ethics@uwindsor.ca](mailto:ethics@uwindsor.ca).

SIGNATURE OF RESEARCH SUBJECT/LEGAL REPRESENTATIVE

I understand the information provided for the study “The Impact of Problem-Solving Strategies and Personality on Memory” as described herein. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

SIGNATURE OF INVESTIGATOR

These are the terms under which I will conduct research.

---

Signature of Investigator

---

Date

## Appendix U

## DEBRIEFING – STUDY 2

First, I would like to hear from you what you think about what we did today, any impression about this study? [Give participant the time needed to answer, note answers]

If participant says they suspected something about stereotypes or intelligence, ask them when they started thinking about that and note here:

There is more to this study than I have told you about so far. But before I tell you exactly what it is, I would like to explain why it is necessary for some kinds of psychological studies not to tell people about the purpose of the study at the very beginning. In some kinds of studies, if we tell people what the purpose of the experiment is and what we predict will happen, some participants might deliberately do whatever they think we want them to do, just to help us out and give us the results they think we want. Alternatively, other participants might deliberately do the opposite of what they think we want, maybe to show us that we can't figure them out. In either case, these participants' reactions would not be a good indication of how they might react in a situation in everyday life, when they didn't think they were being studied. This would make the results of the study not very informative. Therefore, can you see why in some studies we can't tell people about the purpose of the study at the beginning, because it would influence the results and make the data invalid? [Pause and give the participants a chance to ask questions or comment].

Now I would like to explain exactly what we are trying to get at in this study. I told you that the purpose of this study was to investigate the impact of problem-solving strategies and personality on memory. However, this study was actually interested in investigating an effect called stereotype threat. Briefly, stereotype threat occurs when someone is concerned that what they do will provide evidence confirming a stereotype about their group. Ironically, people who are worried that they will be stereotyped will then behave in a way that is consistent with the stereotype. For example, there is the stereotype that women are not as good as men in math. If a woman experiences stereotype threat before completing a math test, such as by being told that women had previously performed poorer on the test than men had, they will then actually perform poorer on the test. Interestingly, if a woman does not experience stereotype threat, she will do just as well on the test as men. The stereotype threat research shows that stereotypes about groups are not necessarily true, and that some members of a stereotyped group will behave in certain ways because of the pressures of a situation. For example, in the women and math research, it can be concluded that women are not less competent

than men in the area of math; instead, they may sometimes underperform because they think others expect them to.

The purpose of this study was to look at how stereotype threat affects the intellectual performance of overweight people. There is the stereotype that overweight people are less intelligent than are non-overweight people; however, if the stereotype threat effect can be demonstrated in this group, then another explanation for this stereotype is that overweight people may underperform on tests because they think that others expect them to. In the stereotype threat condition, participants read a paragraph about how overweight and obese people are not accommodated for their size in the public arena. We thought that this paragraph would make participants think about stereotypes about overweight people, including the stereotype of unintelligence, and this may make them concerned that their performance on the problem-solving task will confirm the stereotype. Based on past research, we predicted that this would make them actually underperform. However, we expected that participants who did not have this concern will perform just as well as other participants. This research is important because if the stereotype threat effect is shown, this will indicate that the stereotype is not necessarily true; instead, there are other factors that influence the performance of overweight people on intellectual tasks. This may then help decrease discrimination and stigmatization. In the control condition, our aim was to see how participants reacted without stereotype threat, so participants in this condition did not read a paragraph about discrimination against overweight and obese individuals.

There were four instances during the course of this study where we were required to be deceptive. The first instance was the presentation of the purpose of the study as a memory investigation. Secondly, we were also deceptive about the purpose of the tasks, such as why you read the paragraphs, solved the problems, and completed the questionnaires. The problems actually came after the paragraphs because we wanted to see if performance was affected by reading a paragraph about stereotypes. Thirdly, we were deceptive in not informing you at the beginning of the study of the fact that we would be requesting a measure of your weight and height later on. If we were to inform you of this request at the beginning, it would have compromised the integrity of the study as you would have wondered why we were doing so. Finally, the 10 additional problems that you will do after our talk will not be done for pilot-testing for a future study. Instead, we are interested in seeing whether or not you will perform differently after learning the true purpose of the study. I hope you can see why it was important that deception was used in this study. Do you understand why we had to do that? Do you have any questions? [Pause and allow participant to talk about this if they have any concerns or questions].

Did you have any idea that this is what we were looking at in this study? Yes \_\_\_ No \_\_\_

Did you have at any point any suspicion that we were interested in stereotypes or eating?  
Yes \_\_\_ No \_\_\_

If Yes, at what point?



Your participation in research is very important. In a study like this where we didn't give you all the information up front, we want to make sure that you are satisfied with your participation and that you wish to keep your data in the study. If you tell me now that you do not want your data to be used, we will remove it from our pool of data. Do you want to keep your data in the study, or have it removed? Do you have any questions about that?

Finally, I will have to ask you not to say anything about the true purpose of the study to anyone else. If you told someone else all the things that I just told you, and then they participated in the study themselves, their reactions wouldn't be spontaneous and natural, and their results couldn't be used. So, I would like to ask you not to say anything about the study, other than that you read some paragraphs and completed some problems and questionnaires. Will you promise me that you will not tell others about the study?

We also want to let you know that we realize that some of the questionnaires we asked you to complete were personal in nature. Some of them might have made you think about past experiences you did not want to think about. Some people might be upset after completing questionnaires, while others will not be upset at all. Both of these responses are perfectly normal. If you have any concerns, I really want to encourage you to discuss your reactions with me, either now or later on. I will give you a way to contact both me and my research advisor. If you would prefer to discuss your reactions to the study with someone else, we will give you a list of resources on and off campus that you may contact.

We hope you found your experience of participating in this study interesting. I would be glad to answer any questions you might have.

Appendix V

FINAL CONSENT FORM – STUDY 2



FINAL CONSENT TO PARTICIPATE IN RESEARCH

Title of Study: The Impact of Problem-Solving Strategies and Personality on Memory

SIGNATURE OF RESEARCH SUBJECT/LEGAL REPRESENTATIVE

I have been debriefed and I now understand the exact purpose of the study “The Impact of Problem-Solving Strategies and Personality on Memory.” I maintain my agreement to participate in this study. I have been given a copy of this form.

\_\_\_\_\_  
Name of Subject

\_\_\_\_\_  
Signature of Subject

\_\_\_\_\_  
Date

SIGNATURE OF INVESTIGATOR

These are the terms under which I will conduct research.

\_\_\_\_\_  
Signature of Investigator

\_\_\_\_\_  
Date

VITA AUCTORIS

Karen Ip was born in 1981 in Vancouver, British Columbia. She graduated from Killarney High School in 1999, and then attended the University of British Columbia, where she obtained a Bachelor of Arts in Honours Psychology in 2003. At the University of Windsor, she obtained a Master of Arts in Clinical Psychology in 2006. She will graduate with a Doctorate in Philosophy in Clinical Psychology in Fall 2011.