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# An Exploration of Attitudes about Weight in University Students: The Interaction of Perceptual Reliance and Controllability on Explicit Anti-Fat Bias Attitudes

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# The Interaction of Perceptual Reliance and Controllability on Explicit Anti-Fat Bias Attitudes

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Abstract

This experiment examined the effect of perceptions of body weight as being controllable, on attitudes towards people based on their weight and if perceptual reliance moderates this relationship. Perceptions of controllability were altered by informing participants about the influences on weight over which people lack control (or not) and following this, they reported their attitudes and beliefs towards obese individuals through self-report questionnaires. We predicted that participants who were educated about the genetic causes of obesity would reveal more positive attitudes following the manipulation, and that perceptual reliance would moderate the effect of the manipulation. Participants were 97 university students (75 female, 21 male, 1 other). Perceptual reliance predicted both attitudes and beliefs towards obese persons. However, the main effect of controllability and interaction between controllability and perceptual reliance were not significant.

*Keywords:* anti-fat bias, controllability, perceptual reliance

# An Exploration of Attitudes about Weight in University Students: The Interaction of Perceptual Reliance and Controllability on Explicit Anti-Fat Bias Attitudes

Prejudice towards obese people is extremely common in North America and has very serious implications for those who experience it. It is important to determine why some people hold more prejudicial attitudes towards obese individuals than others and if it is possible for these attitudes to be changed. Perceptual reliance, the tendency to judge others based on physical appearance, may explain when anti-fat prejudice occurs. Although previous research identifies perceptual reliance as a predictor of anti-fat bias, it is not yet clear whether it also explains when certain people's prejudicial attitudes towards obesity can be changed.

In this study, our goal was to determine if altering perceptions of controllability by informing people about the influences on weight over which people lack control (such as genetics) would lead to participants viewing overweight individuals in a more positive manner. We predict that people who score low on perceptual reliance would be most influenced by the manipulation, thereby being more likely to view overweight individuals more positively after perceptions of controllability are altered. The rationale behind this is that these people are less likely to use physical features to form social impressions in the first place; therefore, they would be more likely to be impacted after being educated about the causes of obesity beyond one's control. In contrast, people who score higher on perceptual reliance are more likely to judge others based on external stimuli, regardless of the potential "invisible" causes for their physical appearance.

Obese people experience prejudice and discrimination across many different areas, resulting in serious implications. When selecting a sexual partner, an obese partner is least desired by both genders (Chen & Brown, 2012). Obese people often struggle in social situations as contrary to thin people, they may have to first overcome a bias towards them (Crandall, 1994).

Parents of obese children demonstrate less favourable attitudes towards them than they would a normal weight sibling and are less likely to assist them in paying tuition (Crandall, 1991). Obese people are less likely to be hired for a job than thin applicants, even when body weight would not interfere with the job duties (Roe & Eickwort, 1976). As this bias is so widespread, the likelihood of an obese person not experiencing some form of prejudice over the course of his/her life is very minimal, while the consequences of fat prejudice are significant. Undoubtedly, determining not only why people engage in anti-fat bias but also how to change these attitudes is advantageous to the livelihood of overweight and obese people.

Obesity is undesirable in North America where a pro-thin bias is dominant. Through various outlets such as television, magazines and movies, the actors and models are almost always thin. It is very rare to see an overweight person advertising a product, or in the public eye, perhaps because people tend to attribute positive traits to those who they find to be attractive, while attributing negative traits to those who they find unattractive, without any knowledge as to whether or not the individual deserves these positive or negative ratings (Carels & Musher-Eizenman, 2010). This suggests that that this preference for thinness may be correlated with a dislike for overweight and obese people.

Not only is a preference for thinness the norm but prejudice towards those who are overweight or obese seems to be acceptable among people, regardless of the widely held belief that discrimination is unacceptable (Carels & Musher-Eizenman, 2010). Anti-fat biases are negative thoughts and feelings that people possess towards overweight and obese people, which result in attributing to them negative personality traits based solely on the individual's physical appearance (Crandall, 1994). It appears that certain psychological mechanisms drive anti-fat bias, such as perceptions of controllability, which causes people to believe that it is appropriate

to discriminate against these people based on their body weight because they are simply choosing to be fat, when through diet and exercise they could be thin (Crandall, 1994). While other forms of prejudice such as racism have been decreasing in past years or remaining stable, prejudice towards obese people is becoming more prevalent, nearly doubling over the course of ten years, increasing from 7% to 12% (Andreyeva, Puhl, & Brownell, 2008). Perhaps this increase is related to the continuously growing obesity epidemic, described now as the most serious health problem in North America, even more so than smoking, which was the former (Sturm, 2002). This is an additional reason for the importance of research in this area.

Moreover, research suggests that fat people are more likely to be from a lower social class and social economic status (Sobal & Stunkard, 1989). Lack of education and employment opportunities are two factors that could lead to one being in a lower social economic status, thus it is important to determine why these prejudicial attitudes exist and under what circumstances they are able to be changed in order to reduce the prevalence of anti-fat bias in years to come.

Anti-fat bias is rooted in negative obesity stereotypes such as the belief that fat people are lazy, undetermined, lack ambition or lack a protestant work ethic--a belief that hard work and determination leads to success (Crandall, 1994). Fat prejudice is not only evident in those who are of thin or normal weight as several studies have found anti-fat bias stereotypes exhibited by those who are overweight and obese (Schwartz, Vartanian, & Nosek, 2006; Wang, Brownell, & Wadden, 2004). When testing implicit anti-fat bias attitudes, overweight people show a propensity to automatically prefer thin people, suggesting in-group devaluation and only a slight in-group bias (Rudman, Feinber, & Fairchild, 2002). This finding is contrary to other research, which suggests other stigmatized groups have favourable attitudes towards the group in which they belong (Crocker, & Luhtanen, 1990; Rudman et al., 2002). Perhaps this indicates that being

overweight or obese is portrayed as so unbecoming and undesirable in Western culture that even those who are obese have adopted and internalized both negative obesity stereotypes and unfavourable attitudes towards other obese people.

Specifically, anti-fat bias can be explained by Attribution theory, which describes how people interpret events and attach meaning to them. It explains how a person uses information to interpret events and infer causal explanations for these events, including social stigmas (Weiner, Perry, & Magnusson, 1988). Ultimately, the cause of the stigma is used to explain other's reactions towards those who are stigmatized. For example, when the cause for the stigma is perceived to be within one's control, such as contracting HIV due to intravenous drug use, rather than sympathizing, anger is exerted, whereas if the cause of the stigma is perceived to be beyond one's control, such as contracting HIV through perinatal transmission, (during pregnancy) others are more likely to sympathize and help, rather than show anger (Weiner et al., 1988).

In terms of anti-fat bias, attributions for obesity can be either something that is beyond one's control, such as biological or genetic factors, or within one's control for example lifestyle factors, such as diet and exercise. When others infer controllable attributions regarding causes of obesity, they are less likely to want to help or feel sympathy as they feel that the obesity is something that was avoidable and preventable, as opposed to beyond their control. Based on these assumptions, controllability (the amount of control a person has over his or her body weight) has been widely studied as a factor contributing to why people express anti-fat bias (Weiner et al., 1988; Black, Sokol, & Vartanian, 2014; Crandall, 1994).

Weiner and colleagues (1988), examined the relation of controllability and social stigma by altering participants' perceptions of individual responsibility for a particular disorder's onset such as cancer, AIDS, drug addiction and obesity, among others. Obesity was described as due to

either a glandular dysfunction (uncontrollable) or excessive eating without exercise (controllable). The stigmas in which the onset was described as uncontrollable elicited feelings of pity and helping from the study participants, while the controllable onset condition elicited feelings of anger and an unwillingness to help (Weiner et al., 1988). This research indicates that people seem to feel the need to place blame upon someone in regards to the cause of the stigma and the consequences which ensue. It also further reaffirms that when people determine the individual at the centre of the social stigma is choosing their situation, it elicits more negative feelings, as attribution theory would predict.

Similarly, in addition to perceptions of controllability, offset effort (the level of effort one exerts to lose weight) has been linked as a contribution to why people express anti-fat bias. According to attribution theory, when individuals are evaluated in terms of failure, those who exerted the least effort are rated the most negatively, regardless of the initial cause of the problem. Researchers examined the coupled effects of manipulating both controllability and individual's efforts to lose weight and found that those who were obese but showed the most effort regardless of their having no control over their weight were rated more positively (Black et al., 2014). This outcome was contrary to Weiner's (1988) research in which the initial cause of the stigma predicted other's attitudes towards the stigmatized person. This also suggests that when targets are described as not having control over their weight, other's attitudes towards them become more favourable.

Additionally, Crandall (1994) suggested that an underlying reason for prejudice towards obese people is rooted in the cognitive bias "belief in a just world", the idea that people's actions bring fair, subsequent consequences, or, "you get what you deserve". People tend to want to see the world as fair and just, and a "just world" has the underlying assumption that bad choices lead

to bad outcomes, thereby blaming fat people for their heavier weight must be the result of poor eating and lifestyle choices. This fallacy suggests that people are fat because they have not put enough effort into being thin. However, considerable research indicates that overeating and lack of exercise are not the sole contributors to the obesity epidemic, and that other factors also contribute, such as genetic makeup and biological disorders, yet it is predominantly believed that obese people are to blame for their weight due to negative lifestyle factors (Crandall, 1994; Stunkard et al., 1986). By altering participant's perceptions of obesity as being uncontrollable, for example, by describing genetic disorders such as a deficient thyroid, people expressed less anti-fat bias attitudes than when weight is influenced by factors within one's control, such as diet and exercise (Crandall, 1994).

An important finding shared by several studies is that people's perceptions are malleable and able to be altered to be more positive or negative based on the information they are provided with (Weiner et al., 1988; Black et al., 2014; Crandall, 1994). Thus, overcoming negative stigmas and discrimination towards obese people appears to be a feasible task. Controllability has been consistently found to be a significant predictor of anti-fat bias. However, this logic fails to take into account genetics and other factors which are uncontrollable. Although anti-fat bias is very widespread, still not everyone engages in this prejudicial behavior and of those who do, some exhibit stronger prejudicial attitudes than others. Individual differences help to explain why some people may possess stronger anti-fat bias attitudes than others (Carels & Musher-Eizenman, 2010).

As perceptions of controllability have been so widely studied and research indicates it is a predictor of anti-fat bias, indeed if altering perceptions of controllability alone could reduce fat prejudice, one may predict that this bias would have decreased over the years, rather than the

increase which is evident (Andreyeva et al., 2008). Undoubtedly, individual differences are also contributing, thus, it is important to determine what individual factors contribute to people either engaging in anti-fat bias or not, and what can be done to change these explicit attitudes.

Perceptual reliance is defined as the propensity to use external stimuli to make inferences about others (Carels & Musher-Eizenman, 2010). Rather than taking into consideration qualities such as an individual's personality traits, kindness or intelligence, those who are high in perceptual reliance tend to use only physical aspects which are visible, such as attractiveness and body weight to infer these other qualities which cannot be seen. Research has examined how perceptual features may contribute to social judgements and found that when people score high on perceptual reliance, their evaluations are strongly influenced by the target's physical appearance, as opposed to those low in perceptual reliance (Livingston, 2001). This research stems from the evolutionary notion that what is beautiful is good, as beauty is an indicator of health. Therefore, making inferences that someone is good based on their physical attractiveness is a heuristic, or mental shortcut, which results in being assigned negative stereotypes and sometimes, discrimination against those who are less attractive in appearance (Livingston, 2001).

Carels and Musher-Eizenman (2010) studied the relation between perceptual reliance and anti-fat bias by showing participants images of men and women with varying levels of body mass index, ranging from normal to obese. They were asked to rate the people in the images on several attributes such as, if they would want to hang out with them, or if they have a negative reaction when they see them. Consistent with Livingston's findings (2010), high levels of perceptual reliance were found to contribute to the low ratings of the people in the images, while participants who scored lowest on perceptual reliance were most likely to rate the larger images more positively (Carels & Musher-Eizenman, 2010). This indicates that perceptual reliance is a

predictor of anti-fat bias.

As the aforementioned study is the only literature to date which examines perceptual reliance and anti-fat bias, it is not completely clear the role perceptual reliance has on anti-fat bias and if altering perceptions of controllability would be effective in changing the attitudes of all individuals or if this would vary depending on levels of perceptual reliance. Moreover, this study found that individuals who are high in perceptual reliance but also have strong beliefs that weight is controllable exhibited stronger dislike to the larger BMI images; however, this does not explain whether or not attitudes regarding perceptions of controllability can be changed and if perceptual reliance could explain when an interaction occurs.

Both perceptions of controllability and perceptual reliance have the potential to illicit anti-fat bias attitudes. Currently, no studies have examined perceptual reliance as a moderator of effects of perceptions of controllability on anti-fat bias. Using an experiment to alter participant's perceptions of controllability by informing them about the influences on weight over which people lack control (such as genetics), offers an opportunity to determine if education regarding other causes leading to obesity has the capability of altering prejudicial attitudes towards the overweight and obese.

Our objective was to examine the contribution of the individual difference perceptual reliance and determine if those who score lower in perceptual reliance would be more likely to be impacted by the manipulation and view overweight individuals more positively afterwards. This is based on the notion that people who tend not to rely on outward appearance to make inferences about others would be more likely to be more attentive to and convinced by educational material describing information, such as genetics. Conversely, those who score higher in perceptual reliance would be more likely to continue relying on appearance, despite the

information provided regarding genetics, which may be evidence casting doubt on their previous beliefs.

We hypothesized that when perceptions of controllability (independent variable) are altered by informing people about the influences on weight over which people lack control (such as genetics), participants would view overweight individuals more positively (dependent variable) as compared to the participants in the control group in which perceptions of the controllability of weight were not manipulated. Secondly, we predicted that perceptual reliance would moderate the effect of the manipulation on explicit anti-fat bias attitudes, such that participants who are low in perceptual reliance would be more likely to be impacted by the manipulation.

## Method

### Participants

Participants were 97 undergraduate students enrolled in Psychology 1000/2000 level courses at King's University College, at Western University. (75 Female, 21 Male, 1 Other). The age range was 18.00-55.00 ($M$ = 19.73, $SD$ = 5.07). Participants were recruited using SONA, the psychology department research participation tool and were able to receive bonus marks (up to 2.5%) for completing a related assignment. Participants were free to withdraw from the study at any time and still receive credit for the written assignment.

### Design

The experiment used a between subjects design. There were three levels of the independent variable: genetic influences on weight, genetic influences on personality, no article. The predictor variables (perceptual reliance and controllability) were measured continuously, and there were two measures of the dependent variable: beliefs (BAOP) and attitudes (ATOP)

obese people. We hypothesized that when perceptions of controllability were altered by informing people about the influences on weight over which people lack control (such as genetics), participants would view overweight individuals more positively. Secondly, we predicted that perceptual reliance would moderate the effect of the manipulation on explicit anti-fat bias attitudes. Specifically, that anti-fat bias would be lowest among people low in perceptual reliance who were exposed to the genetic influences on weight article. We predicted that information about genetic influences, particularly on weight, would positively impact attitudes, specifically among people lower on perceptual reliance.

## Materials

**Demographic information**. Participants were asked to provide information such as age, gender, height and weight in order to calculate body mass index (BMI) and ethnic/national background. See Appendix A.

**Perceptual Reliance Index**. The Perceptual Reliance Index (PRI) is a nine-item scale that assesses the propensity to use external stimuli to form social impressions, $\alpha = .68$. For example, “you can tell a lot about someone’s character just by looking at them” and “Japanese and Chinese people are almost physically identical” (Livingston, 2001). The ratings are on a 7-point scale with anchors “strongly disagree” (-3) and “strongly agree” (+3). For the purpose of this study the wording of some items was slightly altered to make it more socially acceptable, for example rather than referring to "Blacks" we said "Black people".

**Articles**. To manipulate controllability, participants read a brief article (approximately 400 words in length) educating the reader about the genetic influences of certain characteristics. The participants were randomly assigned into one of three conditions: those in the experimental condition read an article describing how genetics and biology contribute to one’s body weight

(*N* = 34), while those in the first control condition read an article unrelated to weight, describing the genetic contributions to personality (*N* = 33). The second control group did not read an article (*N* = 30).

The two articles were created from excerpts from scientific academic journals which showed evidence for the contribution of genetics on first, body weight (see Appendix B) and second, personality (see Appendix C). For example, “More than 70 associations between body mass index or obesity and common genetic variants have been reported." (Lyons & Hirschhorn, 2005 p. 216), “Adoption, twin and family studies have demonstrated the importance of genetic influences on personality. In an early study using 137 young twin pairs, the parents rated personality. The average correlation of 11 personality scales was 0.55 for monozygotic (MZ) and -0.07 for dizygotic (DZ) twins.” (Van Gestel & Van Broeckhoven, 2003, p. 840). These excerpts were presented to the participant with its corresponding reference. The articles were equated with similar length in excerpts and strength and type of evidence.

**Beliefs about Obese Persons Scale.** The Beliefs about Obese Persons (BAOP) scale was the first self-report questionnaire answered post-manipulation (Alison, Basile, & Yuker, 1991). This is an 8-item scale that assesses perceptions of the controllability of weight, α = .72. For example, “Obesity is usually caused by overeating” and “In many cases, obesity is the result of a biological disorder (reverse scored)”. The ratings are on a 7-point scale with end points labelled “strongly disagree” (-3) and “strongly agree” (+3).

**Attitudes towards Obese Persons Scale**. To measure global attitudes toward obesity, the Attitudes towards Obese Persons Scale (ATOP) was used (Alison et al., 1991). This is a 20-item scale that measures stereotypical attitudes about obese individuals, α = .84. For example “One of the worst things that could happen to a person would be for him to become obese” and

"Most obese people resent normal weight people". The scale is 7-points with anchors "strongly disagree" (-3) and "strongly agree" (+3).

**Procedure**

Participants signed up to participate in the research through the SONA website. They chose a time slot and were randomly assigned into groups. The participants were emailed a URL to the corresponding condition as the entire study was completed online. After consenting to participate by pressing enter to continue to the next screen, all participants completed the demographic information and then the perceptual reliance index. The experimental group read the article regarding the genetic influence on body weight, the first control group read about the genetic influence on personality, while the second control group read no article. Following this all participants answered the Beliefs about Obese Persons and Attitudes towards Obese Persons scales. Lastly, all participants read the debriefing form online, which was followed by a link to complete the assignment in order to earn the 2.5% bonus marks. The assignment was designed through a separate link in order to keep the participant's responses to the research separate from the assignment in order to remain confidential and anonymous. All data was recorded and stored on Qualtrics, which is a private research software company.

## Results

Frequencies were run on the variables of interest to locate potential input errors and determine the mean, median and standard deviations of the variables. Prior to running reliability analyses, negatively keyed items were reverse scored. Following this, reliability analyses were conducted on the three scales. The Perceptual Reliance Index Cronbach's $\alpha = .64$. The reliability of this scale was improved by deleting two items, which increased Cronbach's $\alpha$ to .68. Although

still slightly low, this published scale has been widely used in previous research (Livingston, 2010). The Beliefs about Obese Persons scale Cronbach's α = .49. By removing three items, it increased Cronbach's α to .72. Lastly, the Attitudes towards Obese Persons scale Cronbach's α = .84 and could not be improved by removing any items.

There were not significant differences between the two control conditions, genetic influence on personality (*M* = .87) and the control condition (*M* = .85) on the outcome variable beliefs, *t* (61) = .91, *ns.* There were also not significant differences between genetic influence on personality (*M* = .37) and the control condition (*M* = .21) on the outcome variable attitudes, *t* (56) = .94, *ns.* Therefore, these two control groups were combined. To test the hypothesis, attitudes and beliefs were regressed on controllability (weight versus control), perceptual reliance, and their interaction. The first regression analysis was conducted with controllability and perceptual reliance as the predictor variables and Beliefs about Obese Persons as the criterion variable. Main effects were entered in the first step of the regression. The $R^2$ obtained was .147, accounting for 15% of the variance. It was determined that perceptual reliance was a significant predictor of negative beliefs about obese persons, as the F-test produced *F* (2, 94) = 8.12, $p < .001$, β=.35, *t* (94) =3.64, $p < .001$. This indicates that as perceptual reliance scores go up, so do beliefs that obesity is under a person's control. See Table 1. There was no evidence for a main effect of controllability on anti-fat bias beliefs, β= .27, *t* (94) =1.58, *ns*. In the second step of the regression, the interaction term (the multiplicative term between controllability and perceptual reliance) was the predictor variable and beliefs was the criterion variable. The $R^2$ obtained was .153, accounting for 15% of the variance. There was also no evidence of an interaction on beliefs, β= .15, t (94) =.79, *ns*.

A second regression analysis was conducted, this time with controllability and perceptual

reliance as the predictor variables and attitudes towards obese persons as the criterion variable. The $R^2$ was .177, accounting for 18% of the variance. Perceptual reliance was found to be a significant predictor of negative attitudes towards obese persons, as the F-test produced $F(2,94)=10.12$, $p < .001$, $\beta=.42$, $t\ (94)=4.46$, $p < .001$. This indicates that as perceptual reliance scores go up, so do negative attitudes towards obese people. See Table 2. There was no evidence for a main effect of controllability on anti-fat bias attitudes, $\beta=.81$, $t\ (94) = .62$, *ns*. In the second step of the regression, the interaction term created previously was the predictor variable and Attitudes towards Obese Persons was the criterion variable. The $R^2$ obtained was .18.9, accounting for 19% of the variance. There was also no evidence of an interaction on attitudes, $\beta= .17$, $t\ (94) = 1.15$, *ns*.

*Table 1*

*Mean Scores for Averaged Scale Items*

| *PRI* | *BAOP* |
|---|---|
| 0.09 (0.93) | -0.78 (0.85) |

*Note. Numbers in parentheses are standard deviations.*

*Table 2*

*Mean Scores for Averaged Scale Items*

| *PRI* | *ATOP* |
|---|---|
| 0.09 (0.93) | 0.26 (0.68) |

*Note. Numbers in parentheses are standard deviations.*

## Discussion

As outlined previously, there were two hypotheses: that when perceptions of controllability were altered by informing people about the influences on weight over which people lack control (such as genetics), participants would view overweight individuals more positively. Secondly, that perceptual reliance would moderate the effect of the manipulation on explicit anti-fat bias attitudes. The manipulation of participant's perceptions of controllability was not effective. It did not predict changes in either beliefs about or attitudes toward obese people. Further, the interaction between perceptual reliance and controllability was found to be non-significant. Therefore, the hypotheses were not supported. However, perceptual reliance was found to predict higher levels of negative beliefs and attitudes towards obese people.

As there was no evidence of a main effect, this suggests it may be more difficult to change individual's perceptions of controllability than simply reading a brief article. Perhaps a stronger intervention is necessary in order to change people's impressions and explain that body weight is not necessarily under personal control. This is contrary to what was anticipated as previous research does show that perceptions are malleable and controllability has been shown to predict anti-fat bias (Crandall, 1994; Black et al., 2014). By manipulating perceptions of controllability, researchers have found it elicits more negative feelings when the weight loss is portrayed to be under the person's control, yet they are not putting out the effort which could lead to weight loss (Black et al, 2014). This suggests people may justify discrimination if they feel people *choose* to be fat when through diet and exercise they could be thin.

These results were inconsistent with previous research, which indicates that people's perceptions are malleable and can be changed, particularly when presented with evidence which contradicts previous beliefs or assumptions they may have (Crandall, 1994). Contrary to these

findings, the participants in this study were not impacted by the manipulation. This may be due to the type of evidence presented. Although all 97 participants were university students, the majority of them were first year students, with the samples mean age being 19.73. Some of the terms used may have been foreign, particularly those describing genes and other anatomical functions, which an individual in their late teenage years may be unfamiliar with. Another possibility is that people's perceptions become more difficult to change with age.

Although university students are typically a widely studied age group, perhaps using younger participants may have been more effective if indeed, over time, perceptions become more permanent and inflexible. Additionally, rather than using journal article excerpts, previous research presented a brief story about an obese individual who's body weight was either controllable or uncontrollable, and also who either put effort into losing the weight or not (Black et al, 2014). Perhaps a different form of intervention may have been more compelling to the participants, resulting in significance being reached.

Attribution theory describes how people interpret events and attach meaning to them, specifically in regards to inferring causal explanations for events. According to this theory, if people infer that obesity is under personal control they are more likely to show bias, whereas if it is perceived to be beyond one's control, people are more likely to empathize, or want to help. In the present study, perhaps the participants did not infer obese people's body weight as being uncontrollable, therefore not impacting their beliefs about and attitudes towards obese people following the manipulation.

Although the interaction was non-significant, there was some evidence for our second hypothesis as people who scored higher in perceptual reliance were more likely to express negative explicit anti-fat bias. This is consistent with what was expected, because these people

who score higher in perceptual reliance tend to reply on using outward appearances to make judgements about others. Therefore, it makes sense they would use body weight to make inferences about people who are obese, resulting in them being assigned negative obesity stereotypes (Carels & Musher-Eizenman, 2010).

Although perceptual reliance was expected to moderate the relationship between controllability and anti-fat bias, perhaps this lack of significance was impacted by the non-significant main effect. Had the manipulation have been effective in altering perceptions of the controllability of body weight, such as by having participants read more compelling evidence, there may have been a significant interaction as well. Participants who rely on outward appearance may be resistant to change their explicit attitudes despite learning information which contradicts their current beliefs, while those who rely on appearance less may be more convinced by the educational information. Unfortunately, this is impossible to determine without first successfully manipulating participants perceptions, therefore, this may be an opportunity for future research.

**Limitations**

As the study was online, there was a chance that participants may not have read the study instructions or questions in full, or at all. To reduce these chances, the study completion length was checked during data analysis to determine if an appropriate amount of length was spent on each question and the study in its entirety. When the study was designed on Qualtrics, during certain sections such as the articles, only small amounts of information were used on each page, requiring the participant to click the next button and to discourage them from simply skimming over the information. As there was a possibility to earn a 2.5% bonus marks, participants may have been more invested in the research and therefore, answered more carefully. University

students typically appreciate the importance of research, and so the likelihood of them not answering appropriately may be lower due to this. Moreover, because the entire sample consisted of undergraduate students, this may threaten external validity.

Lastly, as this experiment tested for explicit attitudes, there was a potential for response bias. Due to the nature of the questions, participants may have been dishonest to make their responses more socially acceptable. Ideally, this chance was lowered as the consent form stated that responses are kept confidential. However, as this study was open to first and second year psychology students, the majority of participants were young adults, who are likely establishing their sense of self and therefore, may be more concerned with things like their outward appearance and the physical appearance of others thus, making them more likely to recognize and report their explicit attitudes.

**Future Directions**

Future research may look at measuring implicit attitudes, such as through the implicit association's task, in order to lower the chance of response bias. Further, using a visual presentation such as presenting evidence through video format or slideshow presentation may be better able to change people's perceptions of body weight as being controllable as opposed to reading the evidence. This may be particularly true in a young sample, in which reliance upon electronics and other visually appealing stimuli are predominantly used.

Moreover, perceptual reliance is a relatively new area of research in terms of anti-fat prejudice, with Carels and Musher-Eizenman's (2010) study being the only one to date which examines this relationship. Although this research did reaffirm their previous conclusion that perceptual reliance can be a predictor of anti-fat bias, it requires further research in order to determine to what extent it contributes, as the moderation for this experiment was non-

significant. Perhaps a stronger intervention in which the main effect reaches significance would also show evidence for moderation.

## Conclusions

The findings of the present study may be used to assist in reducing stigma towards people who are overweight and obese, perhaps through the educational system such as, physical education classes. This form of prejudice has serious implications for those who experience it in many areas of life, including work, school, and relationships and although not successfully accomplished in this study, previous research shows that people's perceptions are malleable (Crandall, 1994; Black et al., 2014). Perhaps beginning anti-fat bias education during one's youth may help reduce this bias in later years. As the literature shows that body weight is influenced by genetic factors, the belief people have that body weight is completely controllable is not only inaccurate, but also unfair. It is important to educate people, particularly those high in perceptual reliance, in order for overweight people to be viewed more positively.

This study made a significant contribution to this body of research in reaffirming that individuals high in perceptual reliance tend to be more likely to report more negative beliefs and attitudes towards obese people, undoubtedly resulting in these individuals being assigned negative obesity stereotypes, regardless of whether or not they deserve these attributions. A better understanding of what contributes to anti-fat bias and how to intervene is crucial in improving the well-being of obese people.

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# Appendix A

Age: _____

Gender: _____

Height: _____

Weight: _____

Ethnic/National background: _____

Appendix B

On the next page you will find excerpts from the scientific articles cited below. The articles report on research addressing the question of whether and how genetics influence obesity. Please read the excerpts carefully.

Berthoud, H., & Morrison, C. (2008). The brain, appetite, and obesity. *Annual Review of Psychology, 59,* 55-92.

Lyons, H., & Hirschhorn, J. (2005). Genetics of common forms of obesity: a brief overview. *The American Journal of Clinical Nutrition, 82,* 2155-2175.

Walley, A., Blakemore, A., & Froguel, P. (2006). Genetics of obesity and the prediction of risk for health. *Human Molecular Genetics, 15,* 124-130.

"Because it is clear that genes and their products ultimately control all bodily functions, including food intake, energy expenditure, and energy balance, it can be said that a fraction of the population is genetically prone to the environmental and lifestyle push toward obesity, while another fraction is resistant." (Berthoud & Morrison, 2008, p. 59).

"In the 1960s, Neel proposed the 'thrifty gene' hypothesis, whereby genes that predispose to obesity would have had a selective advantage in populations that frequently experienced starvation. People who possess these genes in today's obesogenic environment might be those that 'overreact'— not just becoming slightly overweight, but extremely obese. (Walley et al., 2006, p.124)

"The Human Obesity Gene Map summarizes the present situation in the field of common polygenic obesity. There are currently 253 quantitative-trait loci (QTLs) identified in 61 genome-wide scans, and 52 genomic regions contain QTLs supported by two or more studies." (Walley et al., 2006, p.125).

"More than 70 associations between body mass index or obesity and common genetic variants have been reported." (Lyons & Hirschhorn, 2005 p. 216).

"There are many interesting candidate genes in the list, including genes found to be altered in Mendelian or rare obesity syndromes…" (Lyons & Hirschhorn, 2005 p. 216).

"…It seems that obesity is more phenotypically and genetically heterogeneous and more complex than previously thought. Genetics (and probably epigenetics) plays an important role in the energetic imbalance leading to fat accumulation" (Walley et al., 2006, p.128)

"Estimates of heritability range from 30 to 70%, with the typical estimate at 50%, meaning about one-half of the variation in body mass within a population is a result of inherited factors." (Lyons & Hirschhorn, 2005 p. 215).

"It is clear that obesity often tracks in families. Having obese relatives increases one's risk for obesity, even if the family members do not live together or share the same patterns of exercise and food intake." (Lyons & Hirschhorn, 2005 p. 215).

"Unravelling the genetic background associated with every stage of obesity and its consequences for health is of paramount importance, as it may help to suggest less emotive and more efficient ways to manage the obesity phenomenon." (Walley et al., 2006, p.128)

# Appendix C

On the next page you will find excerpts from the scientific articles cited below. The articles report on research addressing the question of whether and how genetics influence personality. Please read the excerpts carefully.

DeYoung, C. (2010). Personality neuroscience and the biology of traits. *Social and Personality Psychology Compass. 4,* 1165-1180.

Van Gestel, S., & Van Broeckhoven, C. (2003). Genetics of personality: are we making progress? *Molecular Psychiatry, 8,* 840-852.

"Prior to the development of neuroimaging, the sole means for assessing brain activity was the electroencephalogram (EEG), which measures the brain's electrical activity at the scalp. Today a number of methods are available for personality neuroscience." (DeYoung, 2010, p. 1166).

"A frequently used design in molecular genetic studies of personality is the candidate gene approach. Since processes in brain were assumed to regulate personality, genes involved in neurotransmitter pathways were primary candidates. In the psychobiological model of personality, three temperament dimensions were hypothesized to be linked to one of three neurotransmitter systems: NS to dopamine, HA to serotonin and RD to noradrenaline.." (Van Gestel & Van Broeckhoven, 2003, p. 841).

"…Heritability estimates for personality traits are in the range of 40% to 80%, depending on trait and method (The heritability of a trait indicates the amount of its variation in a population due to genetic, rather than environmental, variation.) It is important to remember that when either genes or situations have lasting effects on traits, they must do so by changing the brain; thus, personality differences are 'biological' regardless of their heritability, in the sense that they must be proximally generated by the brain no matter whether they originated in genes or environment. (DeYoung, 2010, p. 1166).

"Adoption, twin and family studies have demonstrated the importance of genetic influences on personality. In an early study using 137 young twin pairs, the parents rated personality. The average correlation of 11 personality scales was 0.55 for monozygotic (MZ) and -0.07 for dizygotic (DZ) twins." (Van Gestel & Van Broeckhoven, 2003, p. 840).

"…Each brain system interacts with many other brain systems, and neuroscience models typically attempt to consider these interactions. A causal theory of personality could be based on psychological constructs alone, but this would ignore the fact that the brain is the proximal cause of behavior and experience." (DeYoung, 2010, p. 1176)