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Persistent preconceptions: The role of implicit weight stigma in belief perseverance

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Persistent preconceptions: The role of implicit weight stigma in belief perseverance

by

Curt Craig More

A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Psychology

Program of Study Committee:
L. Alison Phillips, Major Professor
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Jonathan Kelly

The student author, whose presentation of the scholarship herein was approved by the program of study committee, is solely responsible for the content of this dissertation. The Graduate College will ensure this dissertation is globally accessible and will not permit alterations after a degree is conferred.

Iowa State University

Ames, Iowa

2020

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DEDICATION

This dissertation is dedicated to the memory of my grandfathers. To Joseph Kitzke for inspiring me to pursue my doctorate and to Donald Brayshaw for inspiring me to finish it.

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ABSTRACT

Belief perseverance – the tendency for people to maintain an initial belief even after the foundation for that belief has been discredited – has been documented in relation to a variety of topics (e.g., capital punishment, celebrities, politics; Bui, 2014; Carretta & Moreland, 1982; Lord, Ross, & Lepper, 1979), but has yet to be evaluated in relation to weight stigma, one of the most prevalent forms of social disgrace (Tomiyama, 2019). Research on belief perseverance has typically utilized the debriefing paradigm, which involves distributing opposing information to two groups of participants before discrediting said information and asking participants to make a related judgment. Such studies have focused on explicit beliefs and have mainly been conducted within a single experimental session (e.g., Ross, Lepper, & Hubbard, 1975). This study expands upon belief perseverance theory and methods by evaluating the potential moderating role of existing (i.e., implicit) weight-stigma beliefs within the standard debriefing paradigm in addition to the inclusion of a prospectively measured follow-up assessment while also examining the possible moderating effects of confirmation bias and anchoring. Participants read a report, which informed them of either a negative or positive correlation between weight and aggression in young adults, before learning that the information provided to them was falsified and randomly assigned. Participants then immediately completed explicit and implicit measures regarding their views on weight, followed by surveys to assess demographics and their level of anchoring, response bias, and confirmation bias. Two days later, participants completed the explicit and implicit measures a second time. Results revealed (1) that belief perseverance did replicate to views on weight, (2) that implicit beliefs about weight did not moderate explicit beliefs, (3) that neither confirmation bias nor anchoring moderated explicit beliefs, and (4) that these findings were consistent as there was a lack of moderation when measured at a two-day follow up.

CHAPTER 1. INTRODUCTION

Kathleen is convinced that the childhood vaccinations her son received led to his later diagnosis of autism. Luckily for Kathleen, her daughter Susan is well-versed on the vaccine literature. Susan explains that the initial study conducted on the link between vaccinations and autism was illegitimate as the main author was in the midst of developing his own vaccine. Moreover, no other studies were ever able to replicate the findings and the initial study has since been retracted. Susan goes on to explain that vaccinations happen to occur at the same time in the life of a child that autistic symptoms start to present themselves and that this is why people can mistakenly believe that one leads to the other. Despite having these facts presented and explained in detail, Kathleen continues to believe in the link between vaccinations and autism.

It is likely that we have all experienced similar situations in which we offer what seems to be overwhelming evidence opposing the beliefs of others only to find that their views have barely shifted, if at all. In fact, we ourselves are likely to have been similarly entrenched in our own views on more than one occasion. In psychological terms this is known as belief perseverance – a cognitive bias where an individual continues to maintain a belief even after the foundation for that belief has been discredited (Ross, Lepper, & Hubbard, 1975). Previous research has examined belief perseverance in a number of domains including beliefs regarding capital punishment, attitudes towards celebrities, and even judgments about a suspect's guilt (Bui, 2014; Lord, Ross, & Lepper, 1979; More, Madon, Gyll, & Atkinson, 2016).

Despite the number of past studies, research examining belief perseverance has focused primarily on explicit outcomes that are measured using self-report. Given the predictive power that implicit beliefs exhibit in relation to topics such as body satisfaction, dieting, and physical activity, further research is warranted to determine whether implicit beliefs moderate explicit

beliefs in relation to belief perseverance (Glashouwer, Bennik, de Jong, & Spruyt, 2018; Gómez-López, Manzano-Sánchez, Merino-Barrero, & Valero-Valenzuela, 2019; Heider, Spruyt, & De Houwer, 2018). This may be especially true regarding topics that have associated biases, such as weight, as the predictive power of self-report measures can be impaired when dealing with socially sensitive topics (Greenwald, Poehlman, Uhlmann, & Banaji, 2009). Specifically, when the topic is likely to lead individuals to respond in a socially desirable manner, it can result in implicit measures exhibiting greater predictive validity than explicit measures.

Additionally, studies on belief perseverance have been primarily focused on short-term effects. This line of research predominantly involves a brief manipulation followed by an assessment with no further follow-up (e.g., More et al., 2016; Ross et al., 1975). Contrary to this tendency, one study examined the impact of belief perseverance immediately after an experimental manipulation and at a one-week follow up (Anderson, 1983). Results indicated that belief perseverance effects were still present one week after receiving false information. However, it remains unknown whether any possible moderating effects of implicit beliefs exist and whether any such effects persist beyond the limited scope of a single, brief experimental session. Therefore, an examination of such effects over a longer time period would be beneficial as it would illuminate whether they are fleeting or more longer lasting.

Another unique contribution of the present research is to extend belief perseverance to stigma – the social rejection that accompanies individuals who do not align with social norms (Goffman, 1963). The presence of stigma is centuries old, but over the years it has come to represent any form of social disgrace, such as weight stigma, which presently serves as one of the most widespread stigmata (Tomiya et al., 2018). A better understanding of the role that belief perseverance plays in relation to weight stigma is vital as negative views regarding the

weight of others has numerous detrimental effects. For example, previous research has documented that internalizing social attitudes regarding weight stigma can lead to the avoidance of exercise (Vartanian & Novak, 2011) and an increase in caloric intake, which thereby exacerbates the amount of stigma an individual may encounter (Schvey, Puhl, & Brown, 2011). Moreover, obese patients tend to receive poorer quality health care (Phelan et al., 2015) and, not surprisingly, individuals that are subject to weight stigma have increased risk of adverse psychological outcomes such as depression (Wu & Berry, 2018).

Although past research has examined belief perseverance, its effect related to weight stigma has yet to be examined. Moreover, the mechanisms and persistence of such effects have yet to be fully elucidated. Based on these important unanswered questions, the overall goal of the present research was to better understand the impact, mechanisms, and staying power of belief perseverance. With this goal in mind, the pertinent literature is examined below. Specifically, the history in psychology regarding biases and heuristics involved in the decision-making process that may ultimately lead to belief perseverance is reported. A review of belief perseverance as well as explicit and implicit beliefs then follows. Finally, an examination of the literature on stigma is presented, particularly that of weight stigma. Based on the literature, a study was designed to examine whether the belief perseverance effect replicates to views related to weight and aggression, whether implicit beliefs about weight or the tendency to fall prey to cognitive biases moderate such belief perseverance effects, and whether any such effects persist beyond their initial conception.

Bias

Human perception is not infallible. In fact, psychologists have highlighted the impact that bias has on how we perceive the world around us for nearly a century. Dating back to the 1940s,

researchers suggested that the manner in which we perceive stimuli is shackled to the internal events of our own expectations, attitudes, and needs (Erdelyi, 1974). Over time, this perspective became known as the *New Look* (Bruner, 1992). In one of the earliest studies in this field, participants were asked to adjust the size of a variable circular patch of light controlled by a knob until they believed it was equal in size to a plastic disc during four within-subject experimental conditions (Bruner & Postman, 1947). Participants first adjusted the light normally and then received mild electric shocks followed by strong electric shocks. Finally, during the fourth condition, no shocks were administered. Results showed that as the shocks increased in severity, participants became better at matching the light to the disc. However, participants significantly overestimated the size of the disc once the shocks were removed. These results indicate that the tension induced by the shocks served to accentuate relevant cues, but once they were removed a post-tension magnification occurred, which led to an erroneous overestimation in size.

A classic study from this time provides a further demonstration of this perspective. A group of 10-year-old children served as participants and were asked to adjust a light until they believed it was equal in size to the stimuli presented (Bruner & Goodman, 1947). One group of child participants was shown coins while the other group was shown discs of equal size to the coins. Results showed that the children overestimated the size of the coins, but not that of the discs despite the size of both being equal. Moreover, the overestimation tended to increase as the value of the coins increased such that dimes were overestimated more than nickels, but less so than quarters. Further, in a follow-up variation of the study, child participants were divided into a rich group, from prosperous and professional families, and a poor group, from slum areas. Although the children from rich families continued to overestimate the size of the coins, the children from poor families overestimated the size of the coins significantly more. These results

indicate that the internal states of the children (i.e., their subjective need for financial resources) may have impacted their perception of the coins.

These initial studies showed how internal, unseen processes could influence how people perceive objects. However, they also point towards an important implication: not all bias is to the detriment of perception. Specifically, as shown by the increase in accuracy following the introduction of electric shocks, reactions are not always inhibitory, but rather they can lead to enhancements effects as well. Such effects are known as perceptual vigilance and refer to the reduction in recognition thresholds (Erdelyi, 1974).

Cognitive Biases and Heuristics

Due to the studies conducted by the *New Look* researchers, behavioral scientists began to examine the manner in which a number of cognitive biases and heuristics could impact decision-making processes. Although a plethora of cognitive biases may have the potential to support, and ultimately lead to, belief perseverance, there are five that may be particularly influential. These biases include cognitive dissonance, the availability heuristic, anchoring and adjustment, confirmation bias, and the tendency for people to be cognitive misers. Past research discussing and examining each of these biases in regards to their relation to beliefs or, in the case of cognitive misers, the tendency for them to lead to such biases is discussed below.

Cognitive dissonance

Developed in the 1950s, Cognitive Dissonance Theory posits that individuals experience mental discomfort or tension when they simultaneously hold two accessible beliefs that are inconsistent with one another or when a belief and a behavior are not aligned (Festinger, 1957). Such dissonance occurs during situations wherein a belief is met with contradictory evidence. These types of circumstances lead individuals to respond in a manner that reduces dissonance

similar to how the experience of hunger will lead individuals to proceed towards satiation. The simplest way to achieve such dissonance reduction is to simply change what one believes. For instance, an individual may hold the view that it is immoral to strike a child under any circumstance. However, after a particular incident occurs the individual may do so. The individual could then alter his or her view on the manner to avoid dissonance or could reduce dissonance by changing how he or she acts. That is, the individual could choose to never strike a child again. Finally, a third way to minimize the experience of dissonance would be to rationalize the behavior. For example, the individual could perceive that there was no choice, due to extraneous circumstances, to hit a child while also maintaining that it is immoral to do so.

Since its introduction in the literature, a litany of studies has been conducted to examine Cognitive Dissonance Theory. However, the seminal research was published shortly after the theory itself and provided a simple, yet effective method for assessing its impact (Festinger & Carlsmith, 1959). Participants took part in a repetitive and boring task where they spun spools, which was purposefully designed to be tedious. Those in the experimental condition were told beforehand that the study would be fun, whereas those in the control condition were not. Following the boring task, those in the experimental condition were given either one dollar or 20 dollars (the equivalent of over 200 dollars in 2020) to tell a confederate that the task was exciting. It was hypothesized that participants in the one-dollar condition would rationalize their judgments and convince themselves that the task actually was enjoyable because they lacked an alternative justification. Conversely, those in the 20-dollar condition were predicted to view the task as unenjoyable because the financial compensation they received would serve as the main justification for stating otherwise. As expected, participants who received one dollar came to

believe that the experiment was more enjoyable than those who received 20 dollars or those who were in the control condition.

More recent research has specifically discussed and examined the link between cognitive dissonance and belief perseverance (e.g., Zdrok, 2003). In one example, the impact of cognitive dissonance and belief perseverance on consumer choices was assessed (Darrat, 2017). The study examined whether receiving disconfirming evidence impacted consumer beliefs towards the perceived benefits of consuming organic foods. Results showed that dissonance occurred when individuals were given disconfirming evidence, which ultimately led to belief perseverance. That is, when presented with evidence contrary to their original belief, individuals tended to maintain their original belief. Similar to participants in the aforementioned studies, individuals who encounter contradictory information regarding the link between weight and aggression may experience cognitive dissonance and seek to rationalize it away, which could ultimately lead to belief perseverance.

The availability heuristic

Plane crashes are an incredibly rare event, yet people continually overestimate the rate of their occurrence. This is likely a result of the availability heuristic – a cognitive bias whereby an individual determines the likelihood of an event occurring based on how readily instances of such an event come to mind (Tversky & Kahneman, 1973). To test this effect, researchers asked participants whether an English word is more likely to start with the letter K or have the letter K as its third letter. Results showed that participants overestimated the number of words that started with K and underestimated how many words had K as the third letter. These results supported the researchers' hypotheses, as words that begin with a letter are more readily available in memory compared to those that have K as the third letter.

More contemporary articles have explicitly posited the link between the availability heuristic and belief perseverance. For example, researchers have stated that the availability heuristic underlies belief perseverance in relation to task performance (Anderson, 2007). When individuals are assessing their ability to perform a task they are likely to attempt to recall how well they have done previously on similar tasks and their assessment is based on how readily available such memories come to mind. Similar to participants asked to recall words with K as the third letter, individuals who receive information regarding the link between weight and aggression that conflicts with their own views may have more difficulty recalling it in the future. This would then make any confirmatory information or views they may hold more readily available and could therefore lead to belief perseverance.

Anchoring and adjustment

A common sales technique is to offer a high starting price that is above fair market value. This high starting price then serves as an anchor, which leads to a higher final price than if the initial offer had been more fair. This process, where people make estimates based on an initial value that is subsequently adjusted to reach a final conclusion, is known as anchoring and adjustment (Tversky & Kahneman, 1974). After beginning with an initial value (i.e., an anchor), individuals tend to make inadequate adjustments. This results in the initial value having a substantial impact on subsequent assessments.

To test this bias, an experiment was conducted that had participants estimate the percentage of African member countries in the United Nations. First, a number was selected by spinning a wheel in front of participants, which was secretly designed to land either at 10 or 65. Participants were then asked if they believed the percentage was higher or lower than the number shown and then to provide an estimate of their own. Those who saw the wheel land at 10

estimated African countries made up 25 percent of the United Nations, whereas those who saw the wheel land at 65 estimated the percentage to be 45. In a further study, researchers asked participants to estimate the product of a numerical expression within five seconds that was written either as $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8$ or as $8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$ (Tversky & Kahneman, 1974). Participants did not have enough time to complete the calculation and therefore had to estimate based on the first few computations. Results revealed that estimates were significantly lower when the sequence began with the number one than when the sequence began with the number eight.

Building on this earlier work, researchers have gone on to specifically examine the link between anchoring and the perseverance of beliefs. In one such study, self-efficacy beliefs were assessed and participants were randomly assigned to a low, moderate, high anchoring, or no anchor condition (Cervone & Palmer, 1990). Participants then completed a task where the outcome was controlled and completed a second self-efficacy assessment. Results showed that initial self-efficacy judgments persevered in all three anchoring conditions, but not in the no anchor condition. Much like participants in the above-mentioned studies, when people receive conflicting information relating to the link between weight and aggression, they may adjust their beliefs insufficiently. This would give the anchor a greater influence, which could then result in belief perseverance as people fail to adequately adjust their beliefs in light of new information.

Confirmation bias

Perhaps one of the most prevalent biases, and one of the most relevant to the current research, is that of confirmation bias. This bias is the tendency for people to seek out facts to support their beliefs, to more easily recall information that aligns with said beliefs, and to interpret new information in a manner that confirms or aligns with their pre-existing beliefs

(Wason, 1960). First examined nearly sixty years ago, research has shown that individuals will often seek out information that supports, rather than contradicts, their initial beliefs. In an early study, participants were given a set of three numbers that conformed to a simple rule and were asked to generate further number sets to see whether or not they abided by the rule. Participants were given no time limits and once they believed they had discovered the rule they were asked to convey it to the experimenter. Results found that nearly four out of five participants convinced themselves of an incorrect rule. This occurred as a result of participants seeking out confirming evidence while avoiding information that may disconfirm their initial beliefs.

In addition to seeking out supportive information, people also have a tendency to more easily recall information that upholds a belief. In an early study examining such recall bias, participants reviewed a detailed overview of the life of a woman that described both extraverted and introverted traits (Snyder & Cantor, 1979). Two days after reviewing this information, participants were asked to assess the woman's suitability for a job either as a real estate agent or as a librarian. Results found that when asked to recall factual material about the woman, participants recalled more extraverted traits for the real estate agent and more introverted traits for the librarian. In a related study, undergraduate participants were led to believe that either extraversion or introversion was associated with greater academic success (Kunda & Sanitioso, 1989). Those in the extraversion and introversion conditions came to see themselves as having more extraverted or introverted traits, respectively.

Finally, individuals also have a proclivity to interpret new information in a manner that supports an initial belief. This phenomenon is known as biased assimilation due to the tendency for people to examine relevant evidence in a biased manner (Lord, Ross, & Lepper, 1979). In an early test of this bias, 24 proponents and 24 opponents of capital punishment read two articles

taking opposing views on the subject. Participants rated the study that aligned with their views as being more convincing and of higher empirical quality. Moreover, proponents reported being more in favor of capital punishment while opponents reported being less in favor of capital punishment at the end of the study, which demonstrated attitude polarization.

More recent research has expanded upon earlier studies by developing a measure to assess how prone individuals are to confirmation bias (Rassin, 2008). These tendencies, to seek out, more easily recall, and interpret new information in such a manner as to support an initial belief, may all be highly relevant to the perseverance of beliefs. For instance, when assessing the weight of others individuals may seek out information that supports their initial beliefs. Further, when presented with conflicting information they may find it easier to recall facts that support their initial beliefs rather than those that contradict them, which ultimately results in the perseverance of weight stigma beliefs.

People as cognitive misers

Expanding upon previous studies indicating the ubiquity of heuristics used in decision-making processes, researchers introduced the theory that people act as cognitive misers (Fiske & Taylor, 1984). Similar to how a miser refrains from expending financial resources, the human brain often attempts to expend as little effort or cognitive resources as possible. It is this tendency for individuals to cognitively process information as quickly and simply as possible that gives rise to phenomenon such as the aforementioned availability heuristic. On the surface this may make people appear mentally slothful, but it is a rational approach to take. Individuals are bombarded with an incredible amount of information on a daily basis and without processes to help accelerate decision-making, such instances would digest an obscene amount of time in daily life. This tendency for individuals to act as cognitive misers increases the natural proclivity

to use mental shortcuts and fall prey to biases, such as those listed above, which could act to serve as a precursor to belief perseverance in a number of situations including when assessing the weight of others.

Belief Perseverance

It is a common occurrence for individuals to believe things that are no longer, or that never were, objectively true. As previously mentioned, this tendency to maintain beliefs even after those beliefs have been discredited is known as belief perseverance (Ross et al., 1975). Research in the realm of belief perseverance dates back nearly a century to Skinner's (1948) finding that superstitions require only a limited amount of reinforcement to be steadfastly maintained. As an example he noted that this is a common occurrence among card players as a few accidental connections between a ritual and favorable outcomes are all that is required to maintain the belief that a certain behavior is the cause of their good fortune despite the contradiction of numerous unreinforced instances.

Although belief perseverance has been examined in several studies on a diverse array of topics, most have used what is known as the debriefing paradigm. In this paradigm, participants are randomly assigned to groups that receive opposing information. For example, one group may be informed that there is a strong positive relationship between two variables, whereas a second group may be told that there is a strong negative relationship between the same two variables. Participants in both of these conditions are later informed that the information they received was falsified and simply the result of random assignment before being asked to make a judgment related to the information presented. This highlights the strength of the paradigm as the previously received information should be completely discredited and set aside. Therefore, any differences in judgments made following the information being revealed to the participants as the

result of random assignment are indicative of participants improperly having their judgments influenced on the basis of discredited information. Using a rational approach, participants should not rely on any discredited information to make their judgments. However, research has consistently found that they do.

Nearly three decades after Skinner's research on superstitions, the phenomenon of belief perseverance was directly assessed. Researchers gave participants false feedback after completing a discrimination task and subsequently informed them that the feedback was predetermined and not a reflection of their true performance (Ross et al., 1975). Despite being fully debriefed on the nature of the study and the deception that took place, those participants who received false positive feedback continued to rate themselves more favorably than those who received false negative feedback. These findings were followed-up with a similar study in which researchers falsely informed participants of either a positive or negative relationship between risk-taking and being a successful firefighter (Anderson, Lepper, & Ross, 1980). Once again, results showed that despite being debriefed and informed that the information was completely fictitious, participants continued to display their initial beliefs. Those participants who were told that there was a positive relationship between risk-taking and firefighting rated risky behaviors as being highly diagnostic of later success, whereas the opposite pattern was present for participants who were told of a negative relationship.

Based on these early findings, researchers posited that the belief perseverance they discovered was due, at least in part, to participants creating narratives in their mind, a process that they referred to as formulating causal scenarios or explanations (Anderson et al., 1980). Using the Ross and colleagues (1975) study as an example, this reasoning would stipulate that participants who received false positive feedback would then create a narrative in their minds

that it was a task they were naturally talented at. This narrative then instills a confidence in their abilities to the point that even when the reason for their confidence is removed, which occurs after being told that the feedback was false, they still maintain their belief that they are superior at the task. Such narratives may be made explicitly within the conscious awareness of the individual or unconsciously in an implicit manner.

Explicit and Implicit Processes

Although they are closely related and often used interchangeably, including in the present research, many researchers have distinguished between what constitutes a belief versus an attitude. Specific definitions vary, but in general, affective aspects have been assigned to attitudes whereas cognitive aspects have been assigned to beliefs (Fishbein & Raven, 1962). An important distinction is that while some beliefs may be explicit and known to whoever holds them, others may be implicit. These are distinguishable as explicit processes operate in a controlled manner, whereas implicit processes occur automatically. Controlled processes are characterized by being intentional, requiring substantial cognitive resources, having the ability to be stopped voluntarily, and operating within an individual's conscious awareness (Gawronski & Creighton, 2013). Alternatively, automatic processes are characterized by being elicited unintentionally, requiring limited cognitive resources, the inability to be stopped voluntarily, and operating outside of conscious awareness (Bargh, 1994).

In addition to distinctions in conscious awareness and controllability, explicit and implicit beliefs also differ in terms of how they develop and how they change over time. When they were introduced in the literature, implicit beliefs were described as traces of past experiences that impact how we think, feel, or act towards social objects (Greenwald & Banaji, 1995). Based on such a definition, it is no surprise that research has shown that implicit beliefs take longer to

form than explicit beliefs (Leaper, 2003). If implicit beliefs are based on past experience, then by definition they would require time to develop. Whereas explicit beliefs can be formed relatively quickly, implicit beliefs form over time to the point at which they occur automatically beyond conscious awareness.

Not only do implicit beliefs take longer to form than explicit beliefs, they also show greater stability over time (Baron & Banaji, 2006). Of particular importance to the current research is the recent finding that implicit attitudes towards weight were stable over the course of 13 years (Charlesworth & Banaji, 2019). In contrast, explicit beliefs have been shown to be susceptible to manipulations intended to alter them (e.g., Goulding, Furze, & Birks, 2010). Additionally, explicit and implicit beliefs have been shown to synergistically predict intentions and behaviors (Muschalik, Elfeddali, Candel, & de Vries, 2018). Taken together, these studies indicate the importance of considering both explicit and implicit beliefs. Specifically, they suggest that implicit beliefs may serve to moderate the influence of explicit beliefs as measured in the context of the debriefing paradigm.

Dual-Process Models

Over the past several decades a great deal of research has been conducted by utilizing a category of theories known as dual-process theories. Although these theories vary in scope and terminology, they all divide cognitive processes underpinning judgments and behavior into two categories: controlled and automatic (Strack & Deutsch, 2004). However, this is not to say that all processes are entirely controlled or automatic, rather they exist on a spectrum (Melnikoff & Bargh, 2018). In fact, processes are likely to be multi-determined based on a number of factors, such as motivation or cognitive resources, which leads to variation in the degree to which they are controlled or automatic. Nonetheless, these models are useful, as researchers have long been

concerned with the weak relation between controlled processes and behavior (Blumer, 1955; Festinger, 1964). The entirety of such dual-process models is too plentiful for this review, but an examination of some of the more prevalent theories warrants further discussion.

One of the most prominent dual-process theories is the Elaboration Likelihood Model (ELM; Petty & Cacioppo, 1986). The ELM is used in the persuasion literature to assess when differing facets of persuasive messages impact the effectiveness of persuasive appeals. The main premise of the model is that there are two routes through which the persuasiveness of a message is assessed based on how motivated and able individuals are to participate in information processing. The ELM posits that such levels of motivation and ability lead to the use of either the central or the peripheral route for information processing. The central route is explicit and controlled. Using this approach, an individual would assess all relevant information and carefully evaluate the strength of the presented arguments to reach a decision. Conversely, the peripheral route is implicit and automatic. Utilizing this route an individual will often make decisions based on cues, heuristics, or biases, such as the attractiveness of the messenger.

While the ELM examines how persuasion can change attitudes, other dual-process models have focused on how and when pre-existing attitudes impact behaviors. An example of this model type is the Motivation and Opportunity as Determinants (MODE) model (Fazio, 1990). The MODE model posits two processes that serve to direct behavior based upon an individual's level of motivation and whether the opportunity is present to participate in effortful processing. Specifically, the model suggests that there is a spontaneous process, which is implicit and automatic, and a deliberate process, which is explicit and controlled. When an individual has both the motivation and opportunity to engage in effortful processing, then the deliberate process

is likely to occur. However, when motivation, opportunity, or both are absent, an individual is likely to utilize the spontaneous process.

Based on the processes laid out in the ELM and MODE models it may be possible to understand how some beliefs persist even after they have been discredited. Using Anderson and colleagues (1980) study as an example, the ELM and MODE models would suggest that participants who lacked the motivation or opportunity to engage in effortful processing would be more likely to rely on spontaneous (i.e., implicit) processes. If a participant had been given false information about a positive relationship between success as a firefighter and risk-taking behavior, then such a belief may persist unless the participant is motivated and able to deliberately process the false nature of the information. That is, without consciously and effortfully updating a belief, individuals may depend on implicit beliefs as a result of spontaneous processing through the peripheral route following the debriefing paradigm.

In contrast to phenomenon-specific dual-process theories such as the ELM and MODE model, more general dual-process theories have also been posited. One such theory distinguishes between the dichotomy of System 1 and System 2 processing (Kahneman, 2003). Developed in an attempt to connect previous research on biases and heuristics, the theory differentiates between automatic and controlled processes. System 1 (i.e., automatic) processes occur quickly, with little to no effort or conscious awareness, and are often based on emotions. Conversely, System 2 (i.e., controlled) processes are slower, require effort and conscious awareness, and are not driven by emotional responses. Therefore, if no attitude is formed via System 1, then decisions are made solely through the use of System 2. However, if System 1 generates an automatic response, then System 2 may agree with said response, adjust the response, or block

the response. Similar to the MODE model, if System 2 is not activated, System 1 may be entirely responsible for decisions, which could contribute to the perseverance of beliefs.

The Reflective-Impulsive Model (RIM) is another highly regarded dual-process theory (Strack & Deutsch, 2004). The RIM suggests that behavior is the result of two information processing systems that operate in parallel. The reflective system functions under conscious awareness (i.e., controlled), whereas the impulsive system is always activated and operates based on unconscious processes (i.e., automatic). Despite the simultaneous nature of the two systems, the impulsive system takes precedent as, unlike the reflective system, it does not require a minimum threshold of cognitive capacity to operate. That is, when resources are low the impulsive system will control behavior, whereas when resources are high the reflective system will have the ability to override the impulsive system.

Stigma

Although belief perseverance may occur in relation to a number of phenomenon, this is likely especially true with regards to stigma. That is, evidence may arise when we encounter individuals suggesting that they possess an attribute that makes them less desirable. They are then reduced from being viewed as ‘complete’ and ‘normal’ individuals to being viewed as ‘blemished’ and ‘less worthy’, and it is this which is referred to as stigma (Goffman, 1963). In ancient Greece, the term stigma was used to reference signs of low moral status as such signs were physically burnt or cut into individuals to signify their worth or lack thereof. Over time, stigma has come to refer to anything of disgrace. Such stigmata can still refer to visual indicators, but have also been used with regards to internal processes such as stigma towards anxiety, depression, or homosexuality (Griffiths, Batterham, Barney, & Parsons, 2011; Kanter, Rusch, & Brondino, 2008; Linguardi, Baiocco, & Nardelli, 2012).

Weight Stigma

A plethora of stigmata are currently present in Western culture, but perhaps none is more prevalent than that of weight stigma – the social rejection and devaluation that accompanies individuals who do not align with idealized social norms regarding weight and body shape (Tomiya et al., 2018). Studies have long shown the prevalence of weight stigma beliefs. Nearly six decades ago researchers presented children with six images of their peers and had them rank the images (Richardson, Goodman, Hastorf, & Dornbusch, 1961). The images included a normal weight child, a child with crutches, a child in a wheelchair, a child with a hand missing, a child with a facial disfigurement, and an obese child. Results showed that regardless of participants' own race, economic status, or physical ability, the obese child was consistently ranked last. Moreover, further analysis revealed that while both males and females ranked children with social impairments lowest (i.e., facial disfigurement and obesity), this effect was even greater among females.

More recent research into the stigmatization of overweight individuals has found that it is not only widespread, but that the occurrence of such weight stigma is increasing (Vartanian, Pinkus, & Smyth, 2018). Attitudes towards obese individuals seem to be worsening and those who are obese are frequently evaluated in a more negative manner than a host of similarly discriminated against groups. This is problematic given the aforementioned detrimental effects that weight stigma can have on individuals (e.g., exercise avoidance, increase in caloric intake, poorer health care outcomes, and adverse psychological outcomes). Additionally, overweight individuals tend to be stereotyped as lazy, weak, or self-indulgent, and they face discrimination from family, health care providers, coworkers, classmates, and even from other overweight individuals (Major, Eliezer, & Rieck, 2012). Further, contemporary studies indicate that weight

stigma has spread to what used to be fat-positive cultures and that in some studies people have been shown to prefer someone who is mentally ill, has a sexually transmittable infection, or is a recovering drug addict over someone who is overweight for a potential romantic partner (Vartanian, Pinkus, & Smyth, 2014).

Although early research focused exclusively on explicit weight stigma, more modern studies have begun to examine the impact of implicit views towards weight as well. In one such study children explicitly chose overweight figures as friends only 9% of the time (Hutchinson & Müller, 2018). Moreover, the children displayed an implicit preference towards thin individuals and this preference grew higher as children aged. In a related study, parents were shown to display the same types of biases using both explicit and implicit measures (Lydecker, O'Brien, & Grilo, 2018). Taken together, these studies indicate that both explicit and implicit beliefs play a role in the assessment of weight stigma, which makes it an excellent vessel to use in the examination of belief perseverance.

Research Overview and Hypotheses

Based on the prevalence of belief perseverance and weight stigma, the current study tested four hypotheses regarding the relation between these variables. First, it tested the hypothesis that belief perseverance would replicate to views related to weight stigma, which may help to partially explain the pervasiveness of this phenomenon. Second, it tested whether implicit beliefs moderate the impact of explicit beliefs with regards to belief perseverance, which may help to explain belief perseverance effects found in previous studies while also indicating a possible underlying factor in the persistence of weight stigma. That is, existing implicit beliefs may impact how participants respond to the experimental manipulation such that stronger implicit bias towards overweight individuals predicts greater weight stigma. Third, it tested

whether the tendency to fall prey to confirmation bias or the anchoring heuristic moderated the impact of explicit beliefs. Fourth, it tested whether any such effects persist beyond their initial conception. Specifically, whether said effects are present 48 hours following the debriefing paradigm or whether they are limited to occurring only immediately following the experimental manipulation.

Using the debriefing paradigm, participants read a report regarding the link between weight and aggression in young adults and then completed explicit and implicit measures related to stigmatized weight attitudes. In one condition participants were informed that there is a positive correlation between weight and aggression in young adults, whereas in a second condition participants learned that there is a negative correlation between weight and aggression in young adults. A survey assessing the tendency to respond in a socially desirable manner was administered immediately after the debriefing paradigm had concluded, which was followed by the explicit and implicit measures regarding views towards weight. Additionally, explicit and implicit measures, as well as a measure to assess the tendency to fall prey to confirmation bias and a brief task to examine for anchoring, were administered 48 hours following the initial experimental manipulation.

CHAPTER 2. METHOD

Power Analysis

The statistical software G*Power was used to estimate the appropriate sample size required to detect the main effect of belief perseverance (Faul, Erdfelder, Lang, & Buchner, 2007). The analysis was conducted using the conservative power value of $1-\beta = 0.90$ at an alpha level of $\alpha = .05$ (Cohen, 1992). With respect to effect sizes found in previous research using explicit measures, one of the earliest studies on belief perseverance reported a fairly large effect size, $z = \sim 2.75$ (Anderson, Lepper, & Ross, 1980). However, more contemporary studies have reported more moderate effect sizes based on both non-significant, Cohen's $f = .21$, and significant results, Cohen's $f = .23$ (More et al., 2016; More, Madon, Gyll, & Ditchfield, 2018). Although a moderate effect is expected with regards to explicit measures, recent research has found that implicit beliefs have a moderately small effect, Cohen's $f^2 = .06$ (Mensing & Meadows, 2017). Based on these previous studies, a relatively small effect size, Cohen's $f^2 = .05$, was used to estimate the sample size (Cohen, 1988). Based on these parameters, the power analysis revealed that a minimum sample size of 257 would be required to meet the desired level of power. However, due to the 2020 coronavirus pandemic, data collection was terminated early and this minimum sample size was not achieved.

Participants

Participants ($N = 172$) were Iowa State University students who were recruited through the SONA system subject pool and participated in exchange for meeting course requirements. Eight participants were excluded for failing random response check items, seven participants were removed for failing an attention check question, and four participants were excluded based upon the abnormally high speed at which they completed the implicit measures. Excluded

participants were randomly distributed between experimental conditions with the final sample consisting of 153 participants, including 87 women and 66 men between the ages of 18 and 35 with a mean age of 19.28 years. There were 109 European Americans, 14 Latin Americans, 11 Asian Americans, eight African Americans, and 11 participants who identified as multi-ethnic. This study was approved by the Institutional Review Board at Iowa State University (see Appendix A).

Measures

Demographics

In addition to sex, age, ethnicity, and political affiliation, participants also reported their level of desire to lose weight as well as their height in inches and their weight in pounds. Reported heights and weights were then used to calculate a body mass index (BMI) score for each participant. According to the World Health Organization (WHO), a BMI score between 18.5 and 24.9 indicates normal weight while those with a BMI score below 18.5 are considered underweight, those with scores over 25 are seen as overweight or pre-obesity, and those with scores above 30 are categorized as obese (de Onis, Garza, Onyango, & Martorell, 2006).

Explicit Beliefs

The Attitudes Toward Obese Persons (ATOP) scale was used to assess explicit beliefs towards overweight individuals (see Appendix B; Allison, Basile, & Yuker, 1991). The ATOP scale is a 20-item measure that assesses beliefs regarding obesity with higher scores indicating more positive attitudes towards obese persons. Participants respond to questions on a 6-point Likert-type scale with endpoints -3 (*strongly disagree*) and 3 (*strongly agree*). Previous research has established the validity and reliability of the ATOP scale in English as well as Korean, Chinese, Taiwanese, and Turkish speaking populations (Allison, 1995; Dedeli, Bursalioglu, &

Deveci, 2014; Kim, Lee, Hwang, Kim, & Park, 2010; Lacroix, Alberga, Russell-Mathew, McLaren, & von Ranson, 2017; Tsai et al., 2019). One additional question was added to the end of the survey to explicitly address the dependent variable. In addition to the 20 ATOP items, participants were also asked at the 48 hour follow-up: “*What do you believe the correlation is between weight and aggression in young adults?*”, with endpoints -3 (*negative correlation*) and 3 (*positive correlation*) as well as a midpoint of 0 (*no relation*). Descriptions of negative and positive correlations in the context of the experimental manipulation were included to ensure that participants were able to properly interpret the question.

Implicit Beliefs

The Implicit Association Test (IAT) was used to measure implicit beliefs towards weight with higher scores indicating a greater level of implicit bias. The standard IAT measures the strength of associations between attitude objects and concepts, such as between overweight individuals and the concepts of ‘good’ and ‘bad’ (Greenwald, McGhee, & Schwartz, 1998). However, research has shown that the personalized version of the IAT, which uses the concepts of ‘I like’ and ‘I dislike’, is more strongly correlated with explicit measures (Olson & Fazio, 2004). Therefore, the personalized version of the IAT was implemented. The *iatgen* program was used to create an IAT for implicit beliefs towards weight (Carpenter et al., 2018). Participants were asked to match words from ‘I like’ (e.g., attractive, appealing, terrific) and ‘I dislike’ categories (e.g., horrible, despise, negative) with images of thin, normal weight, and overweight individuals.

Since its creation, the IAT has faced some noteworthy and valid criticism. The IAT measures the relative ease with which people associate two concepts or an attitude object and a concept. Therefore, the analyses upon which the IAT relies are based on difference scores, which

increase the likelihood of improperly rejecting the null hypothesis (Cronbach & Furby, 1970). More importantly, some research has revealed that IAT scores fail to predict behavior (e.g., Lee, 2018). However, researchers have also found that the IAT has test-retest reliability and predictive validity (e.g., Rae & Olson 2018). Moreover, the IAT is the most common implicit measure used in psychology research (Gattol, Sääksjärvi, & Claus-Christian, 2011). For these reasons, the IAT was used in the current research.

Social Desirability

To detect, and if necessary control for, the presence of a response bias, the Personal Reaction Inventory (PRI) was utilized as a means of identifying participants who may have responded in a socially desirable manner (see Appendix C; Crowne & Marlowe, 1960). The PRI assesses the tendency for individuals to respond in a way that will make them appear more favorable rather than to respond how they truly feel. The PRI was chosen as socially desirable responding is always a concern in research examining bias or prejudice and there has been extensive research into the reliability and validity of the PRI scale (Beretvas, Meyers, & Leite, 2002; Johnson, Fendrich, & Mackesy-Amiti, 2012; Leite & Beretvas, 2005).

Although the full PRI is a 33-item scale, the 13-item short form scale was used to reduce the number of items participants needed to respond to in an attempt to decrease the likelihood of random responding. Similar to the full PRI, the short form scale is comprised of true and false statements, which assess the natural tendency an individual has towards responding in a manner that is socially desirable. Higher scores on the PRI indicate a tendency to respond in a more socially desirable manner while lower scores suggest a lack of response bias. The reliability and validity for the short form measure is also supported by previous research (Verardi et al., 2010).

Prior to data collection it was determined that if PRI scores correlate with an outcome variable, then they would be used as a covariate in the analyses.

Attention Check

A one-item attention check was utilized to ensure that participants read, remembered, and understood the false information they were provided: (1) “*The article you read indicated that there is _____ correlation between weight and aggression in young adults.*”, with “*a negative*”, “*a positive*”, and “*no*” as answer options. Definitions of what constitutes a negative or positive correlation in the context of the present information were included to ensure participants fully comprehended the question.

Random Responding Check

Participants who randomly respond to survey items can have a significant impact on effect size estimates and statistical results (Credé, 2010). Therefore, two random response check items were placed within the survey measures in an attempt to identify any participants who were randomly responding. Participants who did not correctly answer either or both of the random response checks were eliminated from the data. Additionally, any participants who completed more than 10% of their IATs in fewer than 300ms were removed from all analyses as such speeds are consistent with random responding.

Individual Differences in Cognitive Biases

It is a well-established and encouraged practice in psychological research to examine individual differences simultaneously with the assessment of group-level phenomenon (Cronbach, 1957). With this in mind, individual differences in the tendency to engage in cognitive biases were examined. Specifically, the proclivity to engage in confirmation bias and anchoring were assessed. With regards to confirmation bias, the closed-mindedness subscale of

the Need for Closure scale was used, which examines the level of unwillingness an individual has to having his or her knowledge confronted by alternative opinions or inconsistent evidence (see Appendix D; Kruglanski, Webster, & Klem, 1993; Webster & Kruglanski, 1994). Previous research has established the validity and reliability of the Need for Closure scale and closed-mindedness subscale, which is designed such that higher scores indicate a greater level of unwillingness to integrate contradictory evidence or opposing views (Leone, Wallace, & Modglin, 1999).

In contrast to confirmation bias, the examination of anchoring required a brief task rather than a scale as there are no adequate measures available at this time. In the seminal work on anchoring, researchers asked participants to make a judgment regarding whether a quantity was higher or lower than a number that was randomly generated (Tversky & Kahneman, 1974). Since then, researchers have used this method to examine group effects of anchor magnitude (e.g., Stanovich & West, 2008). However, a more recent approach has been used to examine individual differences and was modified and implemented for the current study (Teovanović, Knežević, & Stankov, 2015). Participants first provided an anchor-free estimate to the question used in the original anchoring study: *“What is the percentage of African countries in the United Nations?”* (Tversky & Kahneman, 1974). Participants were later asked a similar question modified from the standard paradigm of anchoring: *“Do you think the percentage of African countries in the United Nations is higher or lower than 65%?”* before being asked to once again provide an estimate to the question (Stanovich & West, 2008). A bias score was then calculated as the difference between the two estimates divided by the difference between the anchor and the initial estimate, which resulted in a scale where higher scores indicated a higher level of anchoring (Teovanović, Knežević, & Stankov, 2015).

Procedures

Upon arrival to the experimental session, participants were told that the study involved a few brief surveys to be completed 48 hours apart and that they were designed to assess various attitudes and beliefs. Participants first provided demographic information before being presented with a falsified report indicating either that researchers have consistently found a positive correlation between weight and aggression in young adults or that they have consistently found a negative correlation between weight and aggression in young adults. Participants were then asked to provide possible reasons as to why this relation between weight and aggression in young adults exists before completing the PRI scale to assess for response bias. Afterwards, participants were informed that this information was falsified and distributed at random before being asked to complete the ATOP scale to assess for explicit beliefs towards obese persons and an IAT to assess for implicit beliefs towards weight. After 48 hours, participants were expected to return to complete the ATOP scale and weight IAT a second time as well as the closed-mindedness scale and anchoring task before being fully debriefed.

CHAPTER 3. ANALYSES

Preliminary Analyses

Descriptive Statistics

Table 1 presents the means, standard errors, and confidence intervals for participants' time 1 ATOP, time 2 ATOP, time 1 IAT, time 2 IAT, PRI, closed-mindedness, and anchoring scores as well as their BMI and level of desire to lose weight organized by experimental condition. Note that average BMI scores fell in the normal range for participants in the false negative information condition, $n = 76$, $M = 23.74$, $SD = 3.81$, as well as for those in the false positive information condition, $n = 77$, $M = 24.07$, $SD = 4.66$. Additionally, Table 2 presents the correlations between variables for the entire sample whereas Table 3 presents the correlations separately for participants in the negative and positive correlation conditions.

Attention Check

Participants were administered a single attention check item to ensure they were cognizant of the main manipulation between conditions. Out of 172 initial participants, seven (4.07%) failed to correctly identify the false information presented to them as showing either a negative or a positive correlation between weight and aggression in young adults. These participants were removed from all analyses to ensure that the final sample consisted solely of individuals who properly comprehended the material.

Random Responding Check

Participants were presented with two random response check items as the inclusion of random responding has been shown to significantly impact statistical results (Credé, 2010). Out of 172 initial participants, eight (4.65%) failed to correctly respond to one or both of the items, which instructed them to select a specific response. Moreover, four (2.33%) participants were

found to have completed more than 10% of their IATs in under 300ms. Therefore, all of these participants were removed from the data to safeguard against the negative impacts of random responding, which resulted in a final sample of 153 participants.

Main Analyses

Prior to all analyses, the assumptions of normality and homogeneity of variance were assessed for the single assessment item of the dependent variable (i.e., “*What do you believe is the actual correlation between body mass and aggression in young adults?*”) and for ATOP scores (i.e., explicit beliefs towards weight). Additionally, the data were also examined for skewness and kurtosis as well as the possible presence of any outliers. A Shapiro-Wilk test indicated that the assumption of normality had not been met for the single assessment item, $W(153) = 0.91, p < .001$. However, an inspection of the corresponding histogram of responses indicated that the data appeared normal and that the significance of the Shapiro-Wilk test was likely a result of the substantial number of participants who chose the middle option of no correlation (see Figure 1).

After examining the histogram of the single assessment item responses, two further Shapiro-Wilk tests were conducted and indicated that the assumption of normality had been met for ATOP scores at both time 1, $W(153) = 0.99, p = .389$, and at time 2, $W(153) = 1.00, p = .874$. Homogeneity of variance was then assessed with the results of three Levene’s tests showing that the assumption was met for the single assessment item, $F(1, 151) = 0.00, p = .989$, as well as for ATOP scores at both time 1, $F(1, 151) = 0.14, p = .711$, and at time 2, $F(1, 151) = 0.11, p = .745$. Additionally, an examination of the single assessment item and ATOP scores at both time 1 and time 2 found that neither skewness, all $ps > .05$, nor kurtosis, all $ps > .05$, were significant. Finally, single assessment item responses and ATOP scores at time 1 and time 2 were converted

to z scores to detect for the presence of outliers. No scores surpassed the three standard deviation threshold in either direction, which indicated that no outliers were present.

Before assessing differences in the single assessment item and ATOP scores, correlations were first examined to determine if initial differences should be examined by utilizing a t-test or a one-way ANCOVA. Bivariate correlations revealed that there were no significant correlations between the single assessment item and BMI, $r = .04, p = .671$, desire to lose weight, $r = .05, p = .556$, nor PRI scores, $r = -.06, p = .444$. Additionally, there were no significant correlations between time 1 ATOP scores and BMI, $r = -.15, p = .070$, nor desire to lose weight, $r = .04, p = .602$. Similarly, there were no significant correlations between time 2 ATOP scores and BMI, $r = -.10, p = .220$, nor desire to lose weight, $r = .09, p = .274$. However, there was a significant correlation for PRI scores with regards to both time 1 ATOP scores, $r = .28, p < .001$, and time 2 ATOP scores, $r = .24, p = .003$.

To further examine the influence of response bias, partial correlations were examined to determine the impact that response bias, as indicated by PRI scores, had on the correlation between IAT and ATOP scores. Partial correlation results controlling for PRI scores found that there was relationship between time 1 IAT and ATOP scores, $r_{xy.z} = .22, p = .006$, as well as between time 2 IAT and ATOP scores, $r_{xy.z} = .21, p = .010$. Based on the correlational results, differences in responses to the single assessment item between participants in the false positive and negative correlation conditions were assessed using an independent samples t-test. Conversely, two separate one-way ANCOVAs using PRI scores as a covariate were conducted to examine differences in ATOP scores at time 1 and time 2 as a function of false information condition. These three tests were conducted to assess the first research hypothesis, whether the

belief perseverance effect would replicate to weight stigma beliefs, and the third research hypothesis, whether such effects persist beyond their initial conception.

The t-test of the single assessment item was conducted first as it represented the simplest and most straight forward examination of the belief perseverance effect. This item was only assessed once, at the very end of the second experimental session, in an attempt to avoid alerting participants to the true nature of the experimental hypotheses. Results revealed that participants did respond differently based upon which false information condition they were in, $t(151) = -3.47, p = .001, d = 0.56$. Moreover, the results were in the expected direction as participants who received false information regarding a negative correlation between weight and aggression in young adults rated said correlation as more negative, $n = 76, M = -0.09, SD = 1.09$, than did participants who received false information claiming a positive correlation between weight and aggression in young adults, $n = 77, M = 0.48, SD = 0.95$.

Following the t-test, the first one-way between subjects ANCOVA was conducted to examine the effect of false information on explicit beliefs towards overweight individuals while controlling for the effect of socially desirable responding at time 1. The false information condition did not lead to a meaningful difference in terms of time 1 ATOP scores, $F(1, 150) = 2.76, p = .098, \eta_p^2 = .018$, between those participants in the negative correlation condition, $M = 62.59, SD = 12.72$, and those in the positive correlation condition, $M = 65.48, SD = 12.56$, after controlling for the effect of response bias as measured by PRI scores. However, PRI scores were a significant covariate in the model, $F(1, 150) = 13.8, p < .001, \eta_p^2 = .084$. It should be noted that due to the limited sample size the observed power for detecting differences between the false negative correlation and false positive correlation information, $1-\beta_o = 0.38$, was substantially lower than the desired power, $1-\beta = 0.90$, presented earlier in the power analysis section. Results

from a second one-way ANCOVA were similar with respect to time 2 ATOP scores as once again the false information condition did not have a significant impact between those participants in the negative correlation condition, $M = 64.54$, $SD = 14.51$, and those in the positive correlation condition, $M = 66.31$, $SD = 13.36$, after accounting for participants' PRI scores, $F(1, 150) = 0.94$, $p = .335$, $\eta_p^2 = .006$. However, PRI scores were once again a significant covariate, $F(1, 150) = 9.52$, $p = .002$, $\eta_p^2 = .060$, but the observed power for detecting differences between experimental conditions was also very low, $1 - \beta_o = 0.16$.

Model 1: Moderation of Belief Perseverance by Implicit Beliefs at Time 1

Following the t-test and one-way ANCOVAs, a moderation analysis was conducted to assess the second research hypothesis regarding whether implicit beliefs towards weight moderate the effect of false information on explicit beliefs towards obese persons (see Figure 2). To assess for moderation, Model 1 from the PROCESS program using 5000 bootstrapped samples was utilized (Hayes, 2013). The false information condition (i.e., negative or positive correlation) served as the predictor variable with ATOP scores at time 1 (i.e., explicit beliefs) as the outcome variable. Response bias as measured by PRI scores once again served as a covariate in the model. IAT scores at time 1 (i.e., implicit beliefs towards weight) were used as the moderator with IAT results being scored using the *iatgen* program in Qualtrics (Carpenter et al., 2018). This scoring system leads to a difference score, D , for each participant, which is similar to Cohen's d (Greenwald, Nosek, & Banaji, 2003).

Prior to conducting the first model, scores on the moderator (i.e., IAT scores) were mean centered to aid in the interpretation of coefficients and any possible interaction effects. Results from this first model revealed that the overall model was significant with a moderate effect size, $F(4, 148) = 6.74$, $p < .001$, $R^2 = .15$. The individual predictors were then examined and revealed

that the main effect of false information was marginally significant, $b = 3.74$, $t(148) = 1.95$, $p = .053$, $\beta = .15$. Meanwhile, IAT scores were shown to be a meaningful predictor in the model, $b = 16.33$, $t(148) = 2.03$, $p = .044$, $\beta = .51$, and PRI scores were a significant covariate, $b = 1.20$, $t(148) = 3.86$, $p < .001$, $\beta = .29$. Conversely, the addition of the interaction did not make a meaningful difference when added to the model, $F(1, 148) = 1.41$, $p = .236$, $\Delta R^2 = .01$, which indicated a lack of moderation.

Finally, the simple slopes of the conditional effect of false information on explicit beliefs were examined. With respect to the *iatgen* program, for the purposes of this study positive *D* scores correspond to an implicit bias against overweight individuals whereas negative values correspond to an implicit bias in favor of overweight individuals and zero score values indicate a lack of bias altogether (Greenwald, Nosek, & Banaji, 2003). Results revealed that for those with an implicit bias against overweight individuals (i.e., one standard deviation above the mean), false information had a zero effect on explicit beliefs, $b = 1.44$, $t(148) = 0.53$, $p = .596$. Conversely, for those with an implicit bias in favor of overweight individuals, (i.e., one standard deviation below the mean), false information did impact explicit beliefs, $b = 6.05$, $t(148) = 2.21$, $p = .029$, such that receiving false information about a positive correlation between weight and aggression is associated with an increase in positive attitudes towards obese persons. Meanwhile, for those with no meaningful bias in either direction, false information marginally impacted explicit beliefs, $b = 3.74$, $t(148) = 1.95$, $p = .053$, as once again receiving false information about a positive correlation between weight and aggression was associated with an increase in positive attitudes towards obese persons. This indicates that aggression was viewed as a positive attribute for obese individuals among participants with an implicit bias in favor of overweight individuals.

Model 2: Moderation of Belief Perseverance by Implicit Beliefs at Time 2

Following model 1, a second moderation analysis was conducted to assess the third research hypothesis. Specifically, whether any moderation effects would persist beyond their initial conception and be present 48 hours following the experimental manipulation (see Figure 2). Once more, Model 1 from the PROCESS program using 5000 bootstrapped samples was utilized with the ATOP scores and IAT scores from time 1 being replaced by those from time 2 (Hayes, 2013).

Results from this second model revealed that the overall model was significant with a small effect size, $F(4, 148) = 4.37, p = .002, R^2 = .11$. The individual predictors were then examined and revealed that there was a zero effect of false information on ATOP scores, $b = 2.31, t(148) = 1.07, p = .286, \beta = .08$. Similarly, IAT scores did not predict ATOP scores in the model, $b = 6.62, t(148) = 0.72, p = .474, \beta = .18$. However, PRI scores were once again a significant covariate, $b = 1.14, t(148) = 3.20, p = .002, \beta = .25$. Conversely, the addition of the interaction did not make a meaningful difference when added to the model, $F(1, 148) = 0.15, p = .902, \Delta R^2 < .01$, which indicated a lack of moderation.

Finally, the simple slopes of the conditional effect of false information on explicit beliefs were then examined. Results showed that for those with an implicit bias against overweight individuals (i.e., one standard deviation above the mean), false information had a zero effect on explicit beliefs, $b = 2.59, t(148) = 0.84, p = .401$. Similarly, for those with an implicit bias in favor of overweight individuals, (i.e., one standard deviation below the mean), false information also had a zero effect on explicit beliefs, $b = 2.04, t(148) = 0.66, p = .509$. This remained the case for those with no meaningful bias in either direction, as there was no significant impact of false information on explicit beliefs as indicated by ATOP scores, $b = 2.31, t(148) = 1.07, p = .286$.

Individual Differences in Cognitive Biases

Following an assessment of the moderating effect of implicit beliefs, a series of multiple regression models were conducted to examine the possibility of individual differences in cognitive biases predicting ATOP scores. Specifically, the regression models assessed how the tendency for participants to fall prey to confirmation bias or be overly influence by an initial anchor impacted explicit beliefs, as indicated by ATOP scores at time 1 and at time 2. The first regression model added closed-mindedness scores to a model with participants' PRI scores (i.e., response bias) predicting ATOP scores at time 1. Results revealed that the overall model was significant, $F(2, 150) = 8.48, p < .001, R^2 = .10$, and that scores on the closed-mindedness scale marginally predicted ATOP scores, $b = -0.39, t(150) = -1.92, p = .057, \beta = -.16$. Similarly, participants' level of response bias as measured by the PRI predicted ATOP scores, $b = 0.96, t(150) = 2.88, p = .005, \beta = .23$. The next regression model examined the addition of scores on an anchoring bias task to a model with the PRI scores predicting ATOP scores at time 1. Results showed that the overall model was significant, $F(2, 150) = 8.89, p < .001, R^2 = .11$, and that anchoring scores predicted ATOP scores, $b = -4.32, t(150) = -2.10, p = .037, \beta = -.16$. Similarly, PRI scores once again predicted ATOP scores, $b = 1.15, t(150) = 3.64, p < .001, \beta = .28$.

The next two models once again assessed the tendency to fall prey to confirmation bias or anchoring, but were now focused on time 2 ATOP scores. The first of these regression models added closed-mindedness scores to a model with the PRI scores predicting ATOP scores at time 2. Results revealed that the overall model was significant, $F(2, 150) = 5.10, p = .007, R^2 = .06$, but that closed-mindedness scores did not predict ATOP scores, $b = -0.22, t(150) = -0.98, p = .331, \beta = -.08$. However, participants' PRI scores did predict their ATOP scores, $b = 0.97, t(150) = 2.59, p = .010, \beta = .22$. The second regression model examined the addition of anchoring

scores to a model with PRI scores predicting ATOP scores at time 2. Results showed that the overall model was significant, $F(2, 150) = 6.77, p = .002, R^2 = .08$, and that scores on the anchoring bias task continued to predict ATOP scores, $b = -4.62, t(150) = -2.03, p = .045, \beta = -.16$. Consistent with the previous regression models, participants' PRI scores predicted ATOP scores, $b = 1.08, t(150) = 3.05, p = .003, \beta = .24$.

After three of the regression models indicated that individual differences in the tendency to fall prey to cognitive biases predicted ATOP scores, three follow-up moderation models were conducted to determine whether or not such individual differences moderated the relationship between the false information condition and ATOP scores. The first test of moderation once again used Model 1 from the PROCESS program using 5000 bootstrapped samples (Hayes, 2013). The false information condition served as the predictor variable with ATOP scores from time 1 as the outcome variable and PRI scores again serving as a covariate. Closed-mindedness scores were then used as the moderator in this first model (see Figure 3).

Results from this first model revealed that the overall model was significant with a small effect size, $F(4, 148) = 5.63, p < .001, R^2 = .13$. The individual predictors were then examined and revealed that there was a zero effect of false information on ATOP scores, $b = -12.15, t(148) = -1.35, p = .180, \beta = -.48$. However, closed-mindedness scores did predict ATOP scores in the model, $b = -1.35, t(148) = -2.21, p = .029, \beta = -.54$, and PRI scores were a significant covariate, $b = 1.00, t(148) = 3.01, p = .003, \beta = .24$. Conversely, the addition of the interaction did not make a meaningful difference when added to the model, $F(1, 148) = 2.93, p = .089, \Delta R^2 = .02$, which indicated a lack of moderation.

A second model was then conducted examining anchoring scores as a possible moderator at time 1 (see Figure 4). Results of this second model showed that the overall model was

significant with a small effect size, $F(4, 148) = 5.70, p < .001, R^2 = .13$. The individual predictors were then assessed and revealed that there was a main effect of false information on ATOP scores, $b = 4.80, t(148) = 2.15, p = .034, \beta = .19$. Meanwhile, anchoring scores predicted ATOP scores in the model, $b = 6.13, t(148) = 0.75, p = .452, \beta = .23$. However, PRI scores were once again a significant covariate, $b = 1.20, t(148) = 3.79, p < .001, \beta = .29$. Conversely, the addition of the interaction did not make a meaningful difference when added to the model, $F(1, 148) = 1.78, p = .185, \Delta R^2 = .01$, which indicated a lack of moderation.

A third and final model was then conducted examining anchoring scores as a possible moderator at time 2. Results of this third model revealed that the overall model was significant with a small effect size, $F(4, 148) = 4.05, p = .004, R^2 = .10$. The individual predictors were then examined and showed that there was a zero effect of false information on ATOP scores, $b = 3.76, t(148) = 1.50, p = .136, \beta = .14$. Similarly, anchoring scores did not predict ATOP scores in the model, $b = 6.54, t(148) = 0.72, p = .473, \beta = .22$. However, PRI scores once more were a significant covariate, $b = 1.11, t(148) = 3.15, p = .002, \beta = .25$. Conversely, the addition of the interaction did not make a meaningful difference when added to the model, $F(1, 148) = 1.61, p = .206, \Delta R^2 = .01$, which indicated a lack of moderation.

Supplementary Analyses

Following the main analyses, a series of exploratory analyses were conducted to determine if participants' explicit beliefs varied by demographic information. The first set of these analyses were used to determine if participants' explicit beliefs towards weight, as measured by ATOP scores, varied by age, sex, ethnicity, or political affiliation at time 1 or at time 2. At time 1, a series of between subjects one-way ANCOVAs were conducted with PRI scores once again serving as a covariate. Results revealed that ATOP scores did not differ as a

function of age, $F(8, 143) = 1.40, p = .202, \eta_p^2 = .07$, ethnicity, $F(4, 147) = 1.14, p = .341, \eta_p^2 = .03$, nor political affiliation, $F(4, 147) = 0.94, p = .444, \eta_p^2 = .03$. However, ATOP scores did differ by sex, $F(1, 150) = 5.76, p = .018, \eta_p^2 = .04$. Specifically, female participants, $n = 87, M = 66.62, SD = 12.25$, displayed more positive attitudes towards obese persons than did male participants, $n = 66, M = 60.65, SD = 12.54$.

Following the series of ANCOVAs conducted at time 1, the procedure was then repeated using ATOP scores from time 2. Similarly, the results showed that explicit beliefs towards weight as measured by the ATOP scale did not differ as a function of age, $F(8, 143) = 1.30, p = .249, \eta_p^2 = .07$, ethnicity, $F(4, 147) = 0.90, p = .467, \eta_p^2 = .02$, nor political affiliation, $F(4, 147) = 0.90, p = .466, \eta_p^2 = .02$. However, ATOP scores once again differed by sex, $F(1, 150) = 14.14, p < .001, \eta_p^2 = .09$. Specifically, female participants, $n = 87, M = 69.36, SD = 13.69$, continued to display more positive attitudes towards obese persons than did male participants, $n = 66, M = 60.26, SD = 12.55$.

Based on the significant differences in explicit beliefs towards weight between males and females, two follow-up, dual moderation models were conducted (see Figure 5). Model 2 from the PROCESS program using 5000 bootstrapped samples was utilized (Hayes, 2013). Similar to the earlier moderation models, the false information condition (i.e., negative or positive correlation) was entered as the predictor variable with ATOP scores serving as the outcome variable. Response bias, as indicated by PRI scores, was again utilized as a covariate in the model. However, in these models both IAT scores and the sex of participants were used as moderator variables.

For time 1, the overall model was significant, $F(6, 146) = 5.27, p < .001, R^2 = .18$, but sex, $b = 1.54, t(146) = 0.25, p = .802, \beta = .06$, and the sex by false information condition

interaction were both not significant, $b = 1.63$, $t(146) = 0.42$, $p = .674$, $\beta = .15$, which indicated a lack of moderation for sex at time 1. Meanwhile, IAT scores did predict ATOP scores in the model, $b = 15.95$, $t(146) = 1.98$, $p = .049$, $\beta = .49$, but the IAT by false information condition interaction was not significant, $b = -6.02$, $t(146) = -1.22$, $p = .224$, $\beta = -.30$, which indicated a lack of moderation for IAT scores at time 1. Results were similar for time 2 as the overall model was significant, $F(6, 146) = 5.31$, $p < .001$, $R^2 = .18$, but sex, $b = 6.56$, $t(146) = 0.98$, $p = .327$, $\beta = .23$, and the sex by false information condition interaction were both not significant, $b = 0.81$, $t(146) = 0.19$, $p = .848$, $\beta = .07$, which indicated a lack of moderation for sex at time 2. Moreover, IAT scores did not predict ATOP scores, $b = 8.07$, $t(146) = 0.91$, $p = .366$, and the IAT by false information condition interaction was not significant, $b = -0.66$, $t(146) = -0.12$, $p = .908$, $\beta = -.03$, which indicated a lack of moderation for IAT scores at time 2.

Following an examination of the demographic variables, a final set of analyses were conducted to determine if moderation occurred with reference to the aggression-related item of the ATOP scale. As previously noted, the ATOP scale is a 20-item measure that assesses beliefs regarding obesity. However, the scale assesses overall beliefs whereas one item directly assesses beliefs on the link between obesity and aggression (i.e., “*Obese people are often less aggressive than non-obese people*”). Therefore, a set of analyses were conducted that replicated the previous models with the single aggression-related item serving as the dependent variable rather than overall ATOP scores.

The single aggression-related item did not significantly correlate with any of the demographic variables, $ps > .05$. Moreover, the single aggression-related item did not differ by participants’ implicit beliefs towards weight, sex, ethnicity, or political affiliation at time 1 or at time 2, $ps > .05$. However, participants did differ on the single aggression-related item by age at

both time 1, $F(8, 144) = 2.05, p = .045, \eta_p^2 = .10$, and at time 2, $F(8, 144) = 2.27, p = .026, \eta_p^2 = .11$. Two t-tests were then conducted to examine the effect of false information on the single aggression-related item. Results indicated that the false information condition had a significant impact at time 1, $t(151) = 1.98, p = .049, d = 0.32$, but not at time 2, $t(151) = -0.39, p = .698, d = 0.06$.

Based on the significant differences on the single aggression-related item towards weight by participant ages, two follow-up, moderation models were conducted (see Figure 6). Model 1 from the PROCESS program using 5000 bootstrapped samples was utilized (Hayes, 2013). Similar to earlier models, the false information condition as the predictor variable with scores on the single aggression-related item serving as the outcome variable. Results at time 1 indicated that the overall model was not significant and had a small effect size, $F(3, 149) = 2.06, p = .108, R^2 = .04$, with a zero effect of false information on the single aggression-related item, $b = 2.45, t(149) = 0.88, p = .382, \beta = .87$. Meanwhile, age did not predict scores on the single aggression-related item in the model, $b = 0.33, t(149) = 1.27, p = .207, \beta = .43$. Similarly, the addition of the interaction did not make a meaningful difference when added to the model, $F(1, 149) = 1.09, p = .299, \Delta R^2 = .01$, which indicated a lack of moderation.

Meanwhile, Results at time 2 indicated that the overall model was not significant and had a small effect size, $F(3, 149) = 0.37, p = .778, R^2 = .01$. The individual predictors were then assessed and revealed that there was a zero effect of false information on the single aggression-related item, $b = 2.22, t(149) = 0.77, p = .441, \beta = .78$. Meanwhile, age did not predict scores on the single aggression-related item in the model, $b = 0.24, t(149) = 0.87, p = .385, \beta = .30$. Similarly, the addition of the interaction did not make a meaningful difference when added to the model, $F(1, 149) = 0.56, p = .457, \Delta R^2 = .00$, which indicated a lack of moderation.

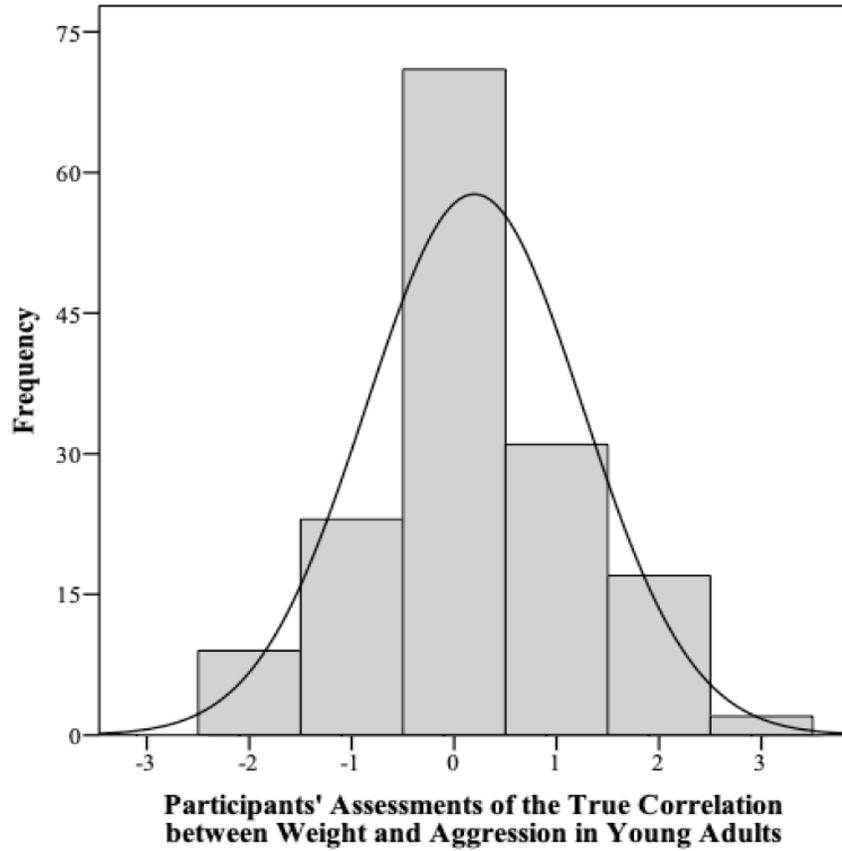


Figure 1. Histogram showing results of the single assessment item of the dependent variable where responses of -3 indicated a strong negative correlation, 3 indicated a strong positive correlation, and 0 indicate no correlation.

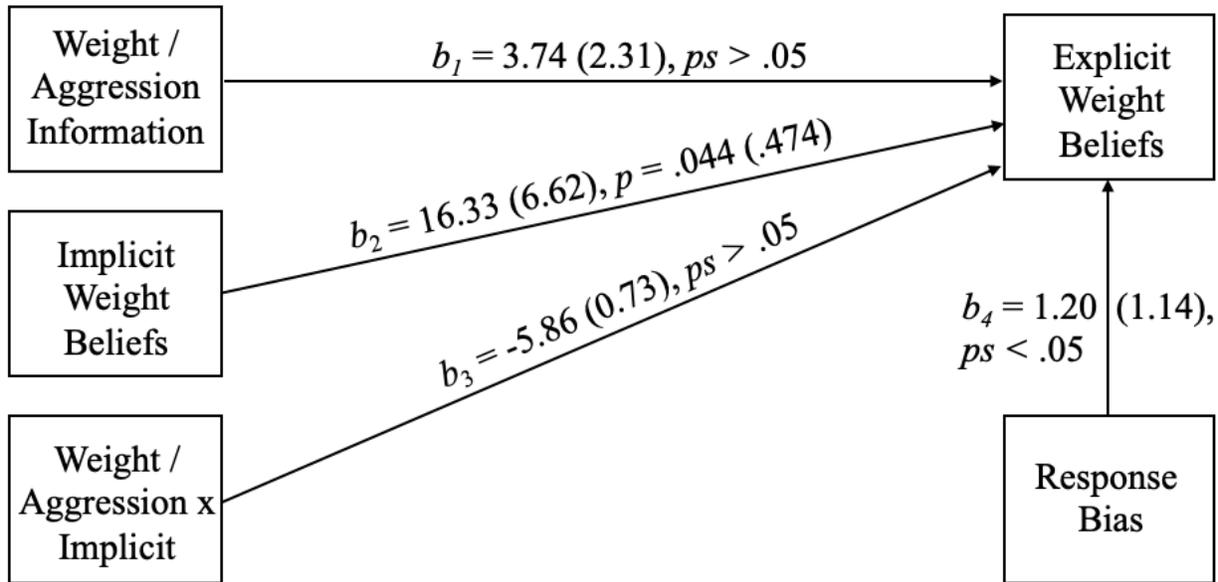


Figure 2. Moderation model examining the total effect of the weight/aggression correlation information, implicit weight beliefs, and the weight/aggression correlation information by implicit weight belief interaction on explicit weight beliefs with the tendency to respond in a socially desirable manner serving as a covariate. Time 1 results are shown with time 2 results in parentheses.

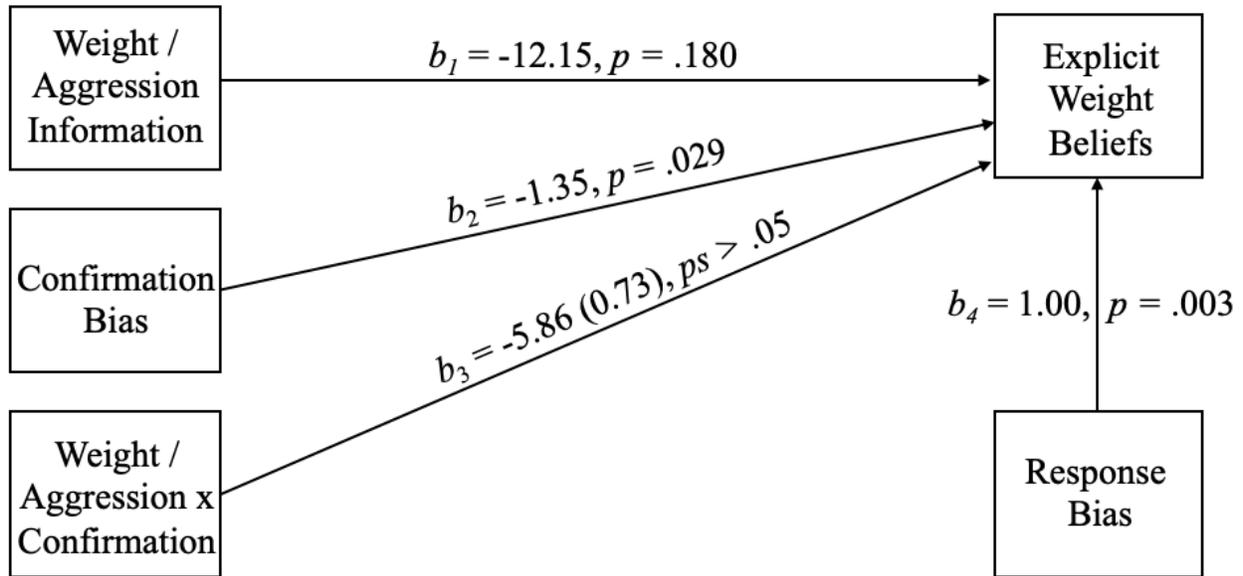


Figure 3. Moderation model examining the total effect of the weight/aggression correlation information, confirmation bias, and the weight/aggression correlation information by confirmation bias interaction on explicit weight beliefs with the tendency to respond in a socially desirable manner serving as a covariate at time 1.

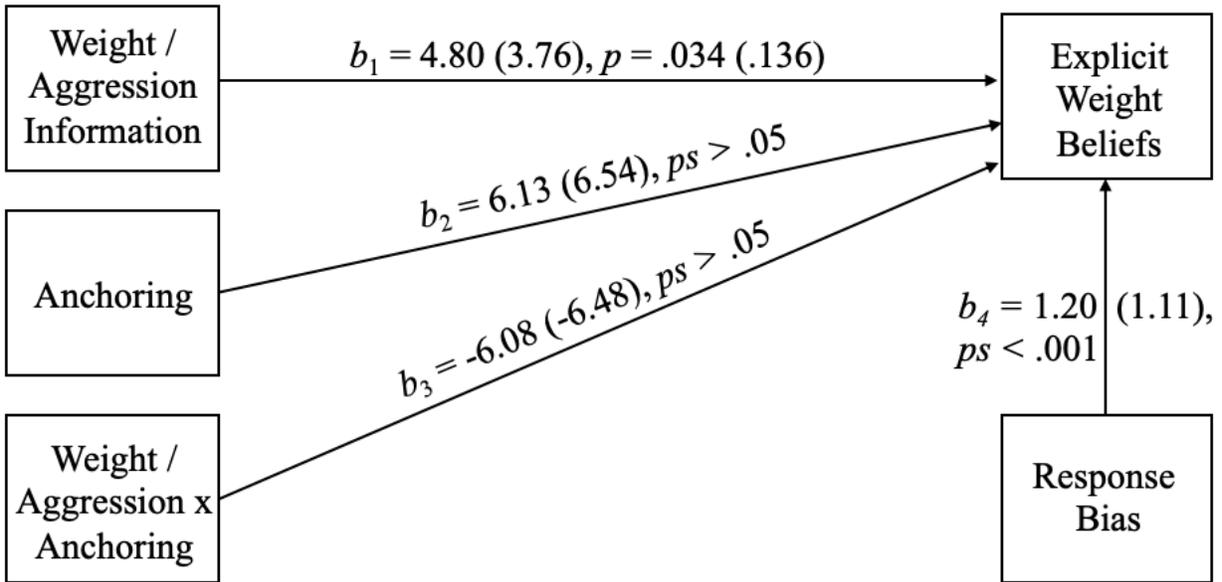


Figure 4. Moderation model examining the total effect of the weight/aggression correlation information, anchoring, and the weight/aggression correlation information by anchoring interaction on explicit weight beliefs with the tendency to respond in a socially desirable manner serving as a covariate. Time 1 results are shown with time 2 results in parentheses.

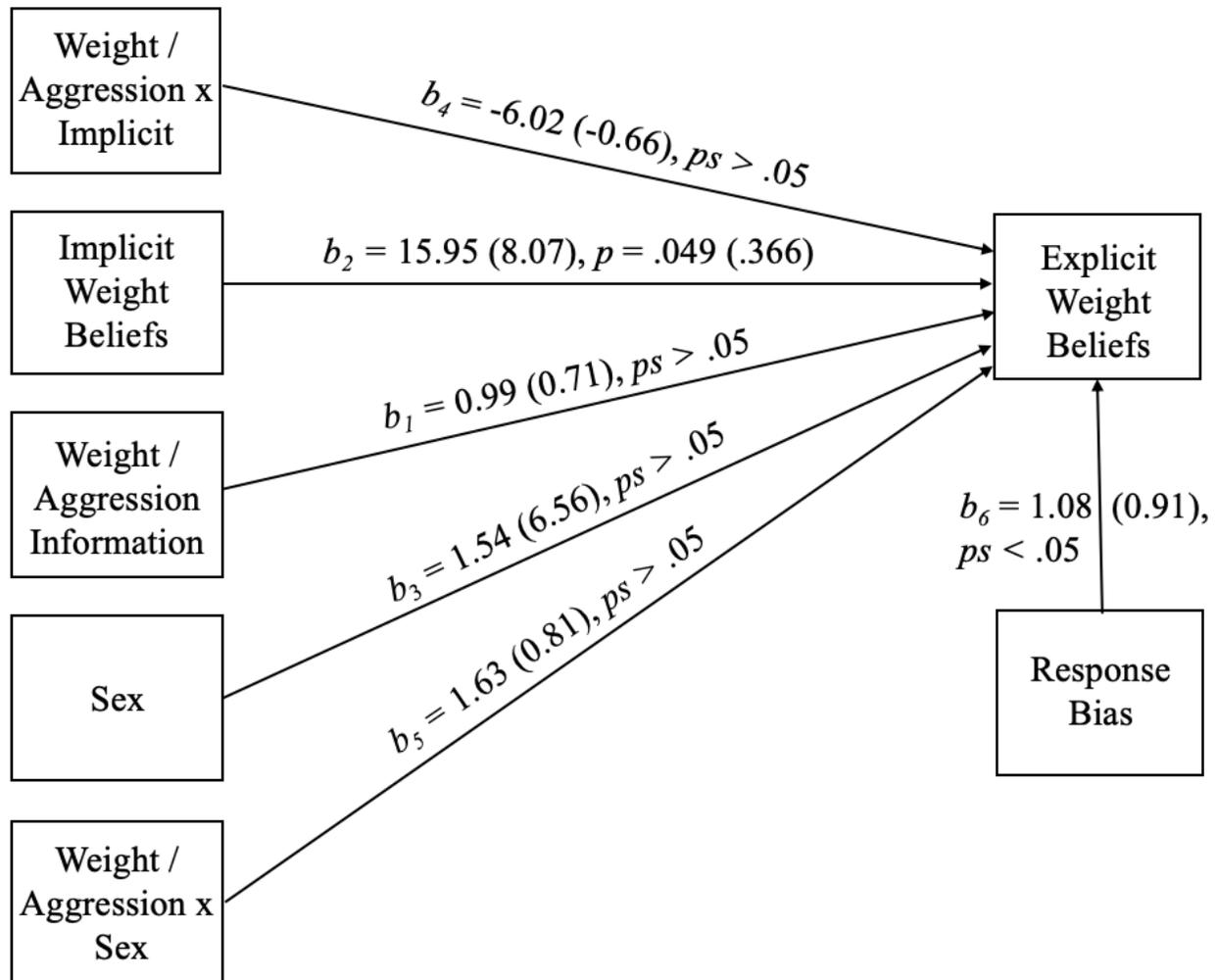


Figure 5. Dual moderation model examining the total effect of the weight/aggression correlation information, implicit weight beliefs, sex, the weight/aggression correlation information by implicit weight belief interaction, and the weight/aggression correlation information by sex on explicit weight beliefs with the tendency to respond in a socially desirable manner serving as a covariate. Time 1 results are shown with time 2 results in parentheses.

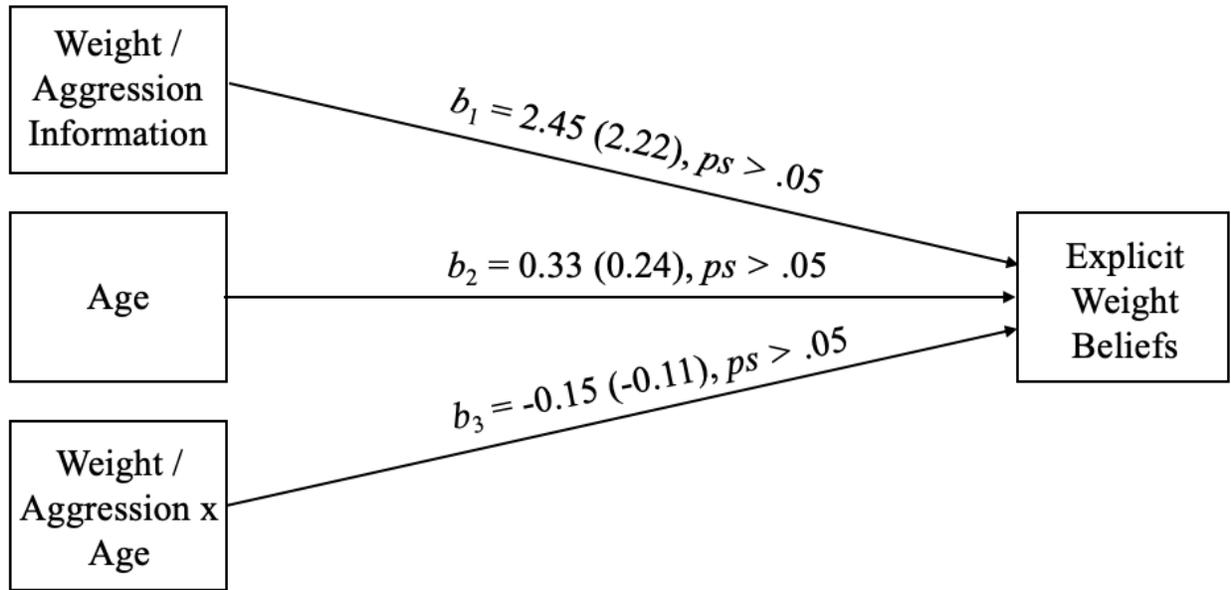


Figure 6. Moderation model examining the total effect of the weight/aggression correlation information, age, and the weight/aggression correlation information by age interaction on the explicit weight beliefs. Time 1 results are shown with time 2 results in parentheses.

Table 1
Descriptive Data for Dependent Variables and Covariates by Experimental Condition (N = 153)

Variable		Negative Correlation Condition	Positive Correlation Condition
ATOP Time 1	<i>M (SE)</i>	62.59 (1.46)	65.48 (1.43)
	95% CI	59.69, 65.50	62.63, 68.33
ATOP Time 2	<i>M (SE)</i>	64.54 (1.66)	66.31 (1.52)
	95% CI	61.22, 67.85	63.28, 69.34
Single Assessment Item	<i>M (SE)</i>	-0.09 (0.13)	0.48 (0.11)
	95% CI	-0.34, 0.16	0.26, 0.70
IAT Time 1	<i>M (SE)</i>	0.03 (0.04)	-0.03 (0.05)
	95% CI	-0.05, 0.12	-0.12, 0.06
IAT Time 2	<i>M (SE)</i>	0.01 (0.04)	-0.01 (0.04)
	95% CI	-0.08, 0.10	-0.09, 0.07
PRI	<i>M (SE)</i>	6.59 (0.35)	6.27 (0.36)
	95% CI	5.90, 7.28	5.55, 6.99
Body Mass Index	<i>M (SE)</i>	23.74 (0.44)	24.07 (0.53)
	95% CI	22.87, 24.61	23.01, 25.12
Desire to Lose Weight	<i>M (SE)</i>	4.78 (0.33)	5.16 (0.38)
	95% CI	4.11, 5.44	4.40, 5.91
Closed-Mindedness	<i>M (SE)</i>	23.11 (0.59)	22.38 (0.56)
	95% CI	21.93, 24.28	21.26, 23.49
Anchoring	<i>M (SE)</i>	0.24 (0.04)	0.25 (0.07)
	95% CI	0.16, 0.32	0.12, 0.38

ATOP = Attitudes Toward Obese Persons.

IAT = Implicit Association Test.

PRI = Personal Reaction Inventory.

Table 2
Correlations ($N = 153$)

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Condition	-	.11	.06	.27**	-.08	-.03	-.05	.04	.06	-.07	-.01
2. ATOP Time 1		-	.83**	.00	.21**	.25**	.28**	-.15	.04	-.23**	-.17*
3. ATOP Time 2			-	-.11	.28**	.19*	.24**	-.10	.09	-.15	-.16*
4. SAI				-	-.16*	-.08	-.06	.04	.05	-.10	.13
5. IAT Time 1					-	.50**	-.01	.11	.19*	.00	.03
6. IAT Time 2						-	-.04	.12	.25**	-.02	.10
7. PRI							-	.03	.15	-.31**	-.01
8. BMI								-	.60**	-.17*	.16*
9. DLW									-	-.20*	.18*
10. CM										-	-.02
11. Anchoring											-
<i>M</i>	-	64.05	65.43	0.20	0.00	0.00	6.43	23.90	4.97	22.74	0.25
<i>SD</i>	-	12.68	13.92	1.06	0.39	0.37	3.08	4.25	3.11	5.03	0.48
Min.	-	35	29	-2	-1.28	-1.34	0	16.01	1	9	0
Max.	-	95	99	3	0.58	0.42	13	39.64	10	37	4.38

Note. Condition coded as: Negative Correlation = 1; Positive Correlation = 2.

ATOP = Attitudes Toward Obese Persons.

SAI = Single Assessment Item.

IAT = Implicit Association Test.

PRI = Personal Reaction Inventory.

BMI = Body Mass Index

DLW = Desire to Lose Weight.

CM = Closed-Mindedness.

* $p < .05$. ** $p < .01$.

Table 3
Correlations by Negative Correlation ($N = 76$) and Positive Correlation ($N = 77$) Conditions

Variable	1	2	3	4	5	6	7	8	9	10
Negative Correlation										
1. ATOP Time 1	-	.84**	-.03	.30**	.22	.35**	-.13	.08	-.36**	-.01
2. ATOP Time 2		-	-.13	.35**	.15	.29*	-.09	.12	-.23	-.01
3. SAI			-	-.08	-.00	-.11	.10	.12	-.09	.08
4. IAT Time 1				-	.45**	-.02	.12	.20	.04	-.04
5. IAT Time 2					-	-.19	.12	.25*	.04	.06
6. PRI						-	-.01	.10	-.33**	-.05
7. BMI							-	.55**	-.09	.12
8. DLW								-	-.10	.15
9. CM									-	.12
10. Anchoring										-
<i>M</i>	62.59	64.54	-0.09	0.00	0.00	6.59	23.74	4.78	23.11	0.24
<i>SD</i>	12.72	14.51	1.09	0.37	0.38	3.01	3.81	2.91	5.13	0.36
Min.	35	29	-2	-1.19	-1.16	0	17.48	1	13	0
Max.	89	96	3	0.58	0.41	13	35.11	10	37	1.33
Positive Correlation										
1. ATOP Time 1	-	.83**	-.04	.15*	.29*	.23*	-.17	-.01	-.08	-.27*
2. ATOP Time 2		-	-.14	.23*	.25*	.20	-.11	-.6	-.05	-.27*
3. SAI			-	-.22	-.15	.02	-.04	-.05	-.07	.18
4. IAT Time 1				-	.54**	-.02	.12	.18	-.05	.07
5. IAT Time 2					-	.10	.13	.27	-.09	.13
6. PRI						-	.07	.19	-.29**	.01
7. BMI							-	.64**	-.24*	.18
8. DLW								-	-.27*	.20
9. CM									-	-.12
10. Anchoring										-
<i>M</i>	65.48	66.31	0.48	0.00	0.00	6.27	24.07	5.16	22.38	0.25
<i>SD</i>	12.56	13.36	0.95	0.41	0.36	3.17	4.66	3.31	4.93	0.57
Min.	38	36	-2	-1.28	-1.34	0	16.01	1	9	0
Max.	95	99	3	0.55	0.42	12	39.64	10	31	4.38

ATOP = Attitudes Toward Obese Persons.

SAI = Single Assessment Item.

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PRI = Personal Reaction Inventory.

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CM = Closed-Mindedness.

* $p < .05$. ** $p < .01$.

CHAPTER 4. DISCUSSION

The central purposes of this study was to explore belief perseverance in the context of weight stigma, to assess the possible moderating effects of implicit beliefs towards weight, and to determine whether any such effects would persist beyond their initial conception. It was expected that providing participants with false information in opposing directions (i.e., a false negative or false positive correlation) would lead to a replication of belief perseverance effects in the context of weight stigma. Moreover, it was predicted that such effects would be moderated by the degree to which individuals have implicit bias towards those who are overweight and that both of these effects would still be present when measured at a 48 hour follow-up experimental session. There was evidence to support the replication of the belief perseverance effect as participants who received information about a false negative correlation between weight and aggression later rated the true correlation between weight and aggression as being more negative than participants who learned of a false positive correlation between weight and aggression. However, there was no support for any moderating effects of implicit beliefs let alone for the continuation of any such moderating effects.

A secondary aim of this research was to attempt to examine whether individual differences in cognitive biases would impact explicit beliefs following the presentation of false information. Specifically, the tendency to engage in confirmation bias and the anchoring heuristic. To measure their individual differences with respect to confirmation bias, participants completed the closed-mindedness subscale of the Need for Closure scale, which assessed the degree to which they struggle with having their knowledge or beliefs contradicted (Kruglanski et al., 1993). Meanwhile, the tendency to be overly influenced by an initial anchor was assessed through a brief task derived from the initial study on the anchoring heuristic (i.e., Tversky &

Kahneman, 1974). The evidence seems to support the influence of individual differences with respect to cognitive biases as confirmation bias scores predicted explicit beliefs during the initial experimental session while anchoring scores predicted explicit beliefs at both the initial and 48 hour follow-up sessions. However, at no point was there support for the presence of a moderating effect of confirmation bias nor anchoring.

Belief Perseverance

Of particular importance to the current study was the cognitive bias of belief perseverance, which refers to the tendency for people maintain an initial beliefs even after the foundation for said belief has been discredited (Ross et al., 1975). Using the debriefing paradigm, participants were randomly assigned to learn of a consistent finding in the empirical literature. Specifically, that there was a strong negative, or strong positive, correlation between weight and aggression among young adults. Participants were later informed that this information was false before being asked to make a related judgment to determine whether the false information had been fully discredited or was still exerting some form of influence over their decision-making processes.

To examine for any belief perseverance effect in the clearest and most effective manner, a single assessment item pertaining directly to the dependent variable of interest was administered at the end of the 48 hour follow-up experimental session. That is, after all experimental procedures had been complete and participants had concluded with surveys administered at the initial session as well as at the 48 hour follow-up, they were asked to report what they believe the true correlation was between weight and aggression in young adults. This direct assessment item was left to the end of the study in an attempt to avoid alerting participants

to the true nature of the experiment. However, it is likely that some participants were able to deduce the main purpose of the study prior to this point.

Analyses revealed support for a belief perseverance effect as those participants who received false information regarding a negative correlation between weight and aggression in young adults indicated that they believed the true correlation was more negative than participants who had been presented with false information of a positive correlation between weight and aggression. Using an entirely rational approach, participants should not have differed in their views as they should not have relied upon any discredited information to make their judgments. Yet, the results suggested that they did as their responses appear to have been influenced by which type of false information they had previously received.

Although this direct test of belief perseverance supported the initial hypothesis of this study, some may note that the false information condition did not lead to subsequent differences with respect to explicit beliefs towards weight as measured by the ATOP scale for the initial experimental session nor for the 48 hour follow-up session. However, it should be noted that the ATOP scale assesses how individuals view obese persons overall (see Appendix B). That is, it is not specifically focused on the relationship between weight and aggression. This is in contrast with the single assessment item, which directly addressed the dependent variable of interest. Therefore, despite the lack of a relationship between the type of false information presented and ATOP scores, the first hypothesis was supported as the belief perseverance effect was shown to replicate to views related to weight stigma

Explicit and Implicit Beliefs

The second central aspect of this study was the possible role that implicit beliefs may play in belief perseverance. Individuals often hold implicit beliefs that differ from their stated

explicit beliefs either due to a response bias or because their true beliefs are unknown even to themselves (Bargh, 1994). Therefore, a moderation analysis approach was utilized to examine the possible influence of implicit beliefs with respect to belief perseverance. This allowed for the assessment of how implicit beliefs impacted the relationship between the false information regarding the correlation between weight and aggression that was presented to participants and to the explicit beliefs towards weight that were reported.

Prior to an examination of the moderation models, correlations between variables were assessed, which showed that participants' explicit and implicit beliefs were all correlated with one another (see Table 2). This indicates that the assessments appear to be related, which supports the likelihood that they are measuring the same underlying beliefs as intended. Moreover, the fact that correlations were significant not only between IAT scores for the initial and follow-up experimental sessions, but between IAT scores and ATOP scores suggests that the IAT did measure implicit beliefs regarding weight as intended. Additionally, IAT scores were shown to have predictive validity in predicting ATOP scores. These findings provide additional support for the IAT as a valid measurement tool despite the previously described shortcomings associated with the test.

Although the overall moderation model results for the initial experimental session were significant and IAT scores predicted ATOP scores, the interaction term between the experimental condition and IAT scores signified a lack of a moderation effect. This indicates that the second hypothesis, that implicit beliefs would moderate the impact of explicit beliefs with respect to belief perseverance, was not supported. A similar pattern of results was discovered for the moderation model based upon the 48 hour follow-up experimental session, which indicated

that the fourth hypothesis, that any moderation effects would persist beyond their initial conception, was similarly not supported.

The lack of moderation effects due to implicit beliefs may suggest that such beliefs do not influence belief perseverance. However, they may also be a result of the measures themselves. As previously noted, the ATOP scale assesses how individuals view obese persons overall. In fact, the ATOP scale only contains a single item related to aggression. This is in contrast to the aims and nature of the false information used in this study. Considering that the focal point of this study was the link between weight and aggression in young adults, it is possible that a more relevant scale would have been more prudent and could have produced differing results.

Cognitive Biases and Heuristics

Psychology has long highlighted the imperfections of human perception as researchers in this domain have found evidence that people's goals, needs, and expectations influence how they perceive the world around them (Erdelyi, 1974). As such, several possible cognitive biases were discussed as having the potential to contribute to the belief perseverance effect. Although numerous such biases had the potential to influence how individuals perceive information, five were singled out as being particularly relevant to the current study. Confirmation bias, anchoring and adjusting, cognitive dissonance, the availability heuristic, and the tendency for people to act as cognitive misers were all discussed as being plausibly relevant. Moreover, it is an established practice in psychology to examine individual differences alongside the assessment of group-level variables. Therefore, in addition to examining belief perseverance and the possible moderating effects of implicit beliefs, the tendency to engage in confirmation bias, anchoring, and how such tendencies could influence explicit beliefs were also assessed.

As previously described, confirmation bias and anchoring were two biases thought to be particularly relevant to the present study. Confirmation bias is one of the most prevalent biases as people often seek ways to support what they already believe while being cautious or avoidant of any new information that contradicts their beliefs (Wason, 1960). Inclinations to seek out, more easily recall, and interpret new information in a biased manner, are all behaviors that may contribute to belief perseverance. For the current study, it was posited that those with pre-existing negative beliefs towards overweight individuals may more easily recall the false information when it aligned with their initial beliefs (i.e., that there is a positive correlation between weight and aggression) despite being informed of its lack of veracity. Similarly, it was believed that anchoring, whereby individuals make estimates based on an initial value or anchor, may also be particularly applicable to the current study. Prior to analyses, it was thought that when participants received contradictory information relating to the link between weight and aggression that they may adjust their beliefs insufficiently and thereby give undue influence to the initial anchor.

Based on the pervasiveness and relevance of these biases, regression models were conducted to determine if individual differences in such biases predicted explicit beliefs. Three of the four models found that such differences did predict explicit beliefs. This indicated that for participants in the current study, their individual tendency to fall prey to cognitive biases often predicted their reported attitudes towards obese persons. However, subsequent analyses indicated that such individual differences among participants did not moderate the relationship between the experimental condition and explicit beliefs. Taken together, these findings indicate that although individual differences in cognitive biases were related enough to predict explicit beliefs, that they were not so influential as to moderate the main effect of the false information.

Despite the lack of moderation, and therefore lack of support for the third hypothesis, the present findings for individual differences in cognitive biases points towards the importance of including assessments of individual-level differences in psychological research. It is worth noting that numerous cognitive biases exist that may have pertained to the current study. Although five such biases were described earlier, only two of these were assessed and implemented. Given the plethora of cognitive biases that could potentially impact empirical results, researchers would be wise to assess, and if necessary control for, such biases in future research.

Limitations

A number of limitations of this research require discussion. First, participants in the study consisted entirely of university students. This is a common critique of numerous empirical studies, but it is worth mentioning in this context. As the main manipulation was directly relevant to students (i.e., the positive or negative correlation between weight and aggression in young adults), it is possible that students may have been disinclined to believe such information from the start. That is, they have been especially knowledgeable of the proposed false relationship based on their personal knowledge of their own cohort. Additionally, one of the limitations of the implicit association test is that experience with the test itself can impact subsequent results and students taking part in psychology studies on a university campus are likely to have past experience completing such measures. Moreover, the relative erudition of the participants in the sample may also have led to them displaying a greater degree of cognitive flexibility, which would therefore lead to a reduction in differences between experimental conditions.

A second limitation was the nature of the dependent variables. First, the core question of whether belief perseverance had replicated to views related to weight was measured with a single item. This is potentially problematic as using a single item measure comes with the burden of reduced sensitivity and lacks any form of internal consistency. Second, the Attitudes Toward Obese Persons scale used as the main dependent variable in all subsequent analyses measures general views towards those individuals who are overweight rather than the specific link between weight and aggression. Therefore, this measure may have lacked the specificity necessary given the experimental manipulation implemented in this study.

A third limitation were the measures used to assess individual differences in cognitive biases. With regards to the anchoring and adjustment heuristic, no known measure of individual differences is present in the current literature. Therefore, a task based upon the initial anchoring article was utilized and paired with a relatively novel calculation for assessing individual differences. Moreover, anchoring was measured using a single task, which comes with a number of concerns previously described. Meanwhile, the closed-mindedness subscale of the Need for Closure scale was used as a proxy for assessing confirmation bias. Although the items in the subscale have face validity (e.g., *"I do not usually consult many different options before forming my own view"*), the subscale was not created for the purpose of assessing confirmation bias. Therefore, it remains uncertain whether confirmation bias was truly measured or whether some other related latent variable was assessed instead.

A final limitation is that which is most apparent: the severe lack of statistical power due to a woefully inadequate sample size. Initial sample size estimates suggested a minimum sample size of 257 participants would be required. However, by early spring of 2020 the coronavirus disease 2019 (COVID-19) caused by the severe acute respiratory syndrome coronavirus 2 virus

strain led to the closure of all colleges and universities in the United States. Due to this closure, data collection was unexpectedly terminated two months earlier than anticipated.

Due to the survey nature of the experimental procedure, some may question why data collection for this study was not moved online following the outbreak of COVID-19. The present study was conducted entirely through an electronic survey, yet was carried out within an experimental research laboratory. This extra precaution was implemented in an attempt to avoid random responding and to ensure consistency between participants by means of environmental distractions. Moreover, it provided the assurance that the surveys at time 1 and time 2 had been completed exactly 48 hours apart. Additionally, there was a concern that the COVID-19 pandemic would increase ingroup salience as well as distrust for outgroup members. This was a concern as the majority of participants in the present study were in the normal BMI range, which thereby made overweight people an outgroup.

Future Research

As previously mentioned, there were several limitations in the current study that should be addressed in future research. First, a more generalizable sample should be utilized so as to avoid any relevant concerns regarding the usage of an all-student sample. Students may be at a unique advantage as they differ substantially from the general population in terms of their knowledge, cognitive flexibility, and familiarity with the implicit association test. Second, researchers should endeavor to use dependent measures consisting of more than a single item and ensure that any scales used have been created and validated for the intended purposes of the variables and relationships under examination.

A third recommendation is for the continued and expanded assessment of individual differences in cognitive biases. Such research holds the promise of a host of potential benefits,

but it is key that scales and assessment tasks be created and validated for the specific cognitive biases of interest. Finally, moderation analyses should be conducted using the proper sample size to ensure statistical power and confidence in any findings. Although this study found no moderation effects, it is uncertain as to whether this is a result of the absence of such effects or the mere inability to detect their presence due to a lack of statistical power.

Conclusion

The present study utilized a theoretical approach in an effort to further the literature on belief perseverance. An overall belief perseverance effect was found, which expanded upon the various topic areas shown to lead to belief perseverance. Additionally, it was found that individuals' tendency to fall prey to cognitive biases predicted their explicit beliefs towards weight and that there were unexpected differences in explicit beliefs between the sexes as well as by age. However, no effects of moderation were detected and, due to several limitations, the findings of this study are far from conclusive. Future research should endeavor to examine the moderating effects of implicit beliefs with regards to belief perseverance while obtaining the necessary statistical power. Moreover, future studies should examine individual differences in cognitive biases as such differences could have a profound impact on experimental results.

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APPENDIX A. INSTITUTIONAL REVIEW BOARD APPROVAL FORM

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
2420 Lincoln Way, Suite 202
Ames, Iowa 50014
515 294-4566
FAX 515-294-4267

Date: 12/06/2019
To: Curt More, Leigh A Phillips
From: Office for Responsible Research
Title: A New Look at Attitudes and Beliefs
IRB ID: 19-572

Submission Type: Initial Submission **Review Type:** Expedited
Approval Date: 12/06/2019 **Approval Expiration Date:** N/A

The project referenced above has received approval from the Institutional Review Board (IRB) at Iowa State University according to the dates shown above. Please refer to the IRB ID number shown above in all correspondence regarding this study.

To ensure compliance with federal regulations (45 CFR 46 & 21 CFR 56), please be sure to:

- **Use only the approved study materials** in your research, including the **recruitment materials and informed consent documents that have the IRB approval stamp.**
- **Retain signed informed consent documents for 3 years after the close of the study**, when documented consent is required.
- **Obtain IRB approval prior to implementing any changes** to the study or study materials.
- **Promptly inform the IRB of any addition of or change in federal funding for this study.** Approval of the protocol referenced above applies only to funding sources that are specifically identified in the corresponding IRB application.
- **Inform the IRB if the Principal Investigator and/or Supervising Investigator end their role or involvement with the project** with sufficient time to allow an alternate PI/Supervising Investigator to assume oversight responsibility. Projects must have an eligible PI to remain open.
- **Immediately inform the IRB of (1) all serious and/or unexpected adverse experiences** involving risks to subjects or others; and (2) **any other unanticipated problems involving risks** to subjects or others.
- IRB approval means that you have met the requirements of federal regulations and ISU policies governing human subjects research. **Approval from other entities may also be needed.** For example, access to data from private records (e.g., student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. **IRB approval in no way implies or guarantees that permission from these other entities will be granted.**

- Your research study may be subject to **post-approval monitoring by Iowa State University's Office for Responsible Research**. In some cases, it may also be subject to formal audit or inspection by federal agencies and study sponsors.
- Upon completion of the project, transfer of IRB oversight to another IRB, or departure of the PI and/or Supervising Investigator, please initiate a Project Closure to officially close the project. For information on instances when a study may be closed, please refer to the IRB Study Closure Policy.

If your study requires continuing review, indicated by a specific Approval Expiration Date above, you should:

- **Stop all human subjects research activity if IRB approval lapses**, unless continuation is necessary to prevent harm to research participants. Human subjects research activity can resume once IRB approval is re-established.
- **Submit an application for Continuing Review** at least three to four weeks prior to the **Approval Expiration Date** as noted above to provide sufficient time for the IRB to review and approve continuation of the study. We will send a courtesy reminder as this date approaches.

Please do not hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.

APPENDIX B. ATTITUDES TOWARD OBESE PERSONS SCALE

Please mark each statement below in the left margin, according to how much you agree or disagree with it. Please do not leave any blank. Use the numbers on the following scale to indicate your response. Be sure to place a minus or plus sign (- or +) beside the number that you choose to show whether you agree or disagree.

-3	-2	-1	+1	+2	+3
I Strongly Disagree	I Moderately Disagree	I Slight Disagree	I Slightly Agree	I Moderately Agree	I Strongly Agree

1. _____ Obese people are as happy as non-obese people.
- *2. _____ Most obese people feel that they are not as good as other people.
- *3. _____ Most obese people are more self-conscious than other people.
- *4. _____ Obese workers cannot be as successful as other workers.
- *5. _____ Most non-obese people would not want to marry anyone who is obese.
- *6. _____ Severely obese people are usually untidy.
7. _____ Obese people are usually sociable.
8. _____ Most obese people are not dissatisfied with themselves.
9. _____ Obese people are just as self-confident as other people.
- *10. _____ Most people feel uncomfortable when they associate with obese people.
- *11. _____ Obese people are often less aggressive than non-obese people.
- *12. _____ Most obese people have different personalities than non-obese people.
13. _____ Very few obese people are ashamed of their weight.
- *14. _____ Most obese people resent normal weight people.
- *15. _____ Obese people are more emotional than non-obese people.
- *16. _____ Obese people should not expect to lead normal lives.
17. _____ Obese people are just as healthy as non-obese people.
18. _____ Obese people are just as sexually attractive as non-obese people.
19. _____ Obese people tend to have family problems.
20. _____ One of the worst things that could happen to a person would be for him/her to become obese.

*Reverse-scored items.

APPENDIX C. PERSONAL REACTION INVENTORY

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is true or false as it pertains to you.

- | | | | |
|------|--|------|-------|
| *1. | It is sometimes hard for me to go on with my work. | True | False |
| *2. | I sometimes feel resentful when I don't get my own way. | True | False |
| *3. | On a few occasions, I have given up doing something because I thought too little of my ability. | True | False |
| *4. | There have been times when I felt like rebelling against people in authority even though I knew they were right. | True | False |
| 5. | No matter who I'm talking to, I'm always a good listener. | True | False |
| *6. | There have been occasions when I took advantage of someone. | True | False |
| 7. | I'm always willing to admit it when I make a mistake. | True | False |
| *8. | I sometimes try to get even, rather than forgive and forget. | True | False |
| 9. | I am always courteous, even to people who are disagreeable. | True | False |
| 10. | I have never been irked when people expressed ideas very different from my own. | True | False |
| *11. | There have been times when I was quite jealous of the good fortune of others. | True | False |
| *12. | I am sometimes irritated by people who ask favors of me. | True | False |
| 13. | I have never deliberately said something that hurt someone's feelings. | True | False |

*Reverse-scored items.

APPENDIX D. CLOSED-MINDEDNESS SCALE

"Attitude, Belief and Experience Survey"

Instructions: Read each of the following statements and decide how much you agree with each according to your beliefs and experiences. Please respond according to the following scale.

1	2	3	4	5	6
Strongly Disagree	Moderately Disagree	Slight Disagree	Slightly Agree	Moderately Agree	Strongly Agree

- *1. Even after I've made up my mind about something, I am always eager to consider a different opinion.
- 2. I dislike questions which could be answered in many different ways.
- 3. I feel irritated when one person disagrees with what everyone else in a group believes.
- *4. When considering most conflict situations, I can usually see how both sides could be right.
- *5. When thinking about a problem, I consider as many different opinions on the issue as possible.
- *6. I prefer interacting with people whose opinions are very different from my own.
- *7. I always see many possible solutions to problems I face.
- 8. I do not usually consult many different options before forming my own view.

*Reverse-scored items.