FACULTY OF PSYCHOLOGY AND EDUCATIONAL SCIENCES

Applying evaluative conditioning to combat obesity prejudice in gym environments

Using a poster to target prejudiced beliefs and the evaluation of individuals perceived as obese or overweight in a gym setting

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Foreword

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Abstract

Objective:

Obesity prejudice is pervasive, especially in sports environments (Boudreault et al., 2022; Greenleaf et al., 2012; Thedinga et al., 2021), and negatively impacts individuals who are overweight or obese, including under -or unemployment, unequal treatment policies., discrimination in health care practices, and a higher risk of self-intentional harm and suicidality. This study aimed to examine the effectiveness of an evaluative conditioning (EC)-based poster, grounded in the newly emerging inferential framework, designed to reduce two common stereotypical beliefs: 'Overweight people are lazy' and 'Overweight people lack motivation to exercise' (**RQ1**); while also assessing its effect on the evaluation of individuals who are overweight (**RQ2**).

Methods:

The researchers hypothesized that the inferential EC-based poster in the experimental condition would significantly reduce the stereotypical beliefs (**H1a**), as well as the reduction would be significantly greater in the experimental condition compared to the control condition (**H1b**), in which a traditional EC-based poster was presented. The inferential EC-based poster included the pairing of individuals who are overweight (i.e., *unconditioned stimulus*) with t-shirts displaying 'I love/heart-symbol fitness' (i.e., *conditioned stimuli*), and a slogan to clarify the relation between the pairings. Both posters were displayed in the gym setting and the outcome variables were measured using pre- and post-intervention questionnaires.

Results:

The results were mixed, providing partial support for **H1a** but no support for **H1b**. This may be attributed to methodological issues common for research in naturalistic settings. While the intervention did not consistently reduce all targeted stereotypical beliefs or consistently show stronger effects than the traditional EC-based poster, it did significantly reduce the belief that overweight people lack motivation to exercise, with a small to moderate effect size. Furthermore, the study may have found a significant positive effect of the inferential EC-based poster on the evaluation outcome. However, this potential effect should be further examined.

Conclusions:

This study highlights the promise of inferential EC-based posters as a potential tool for reducing obesity prejudice and stereotypical beliefs in everyday environments such as gyms. The findings underscore the importance of further research to replicate and refine inferential EC interventions, focusing on optimizing design variations and enhancing their impact in real-world contexts.

Table of contents

Corpus

Introduction

Prejudice, a widely recognized phenomenon, remains a critical and pressing issue with far-reaching implications for diverse social groups and our society at large. Therefore, it is important to combat prejudice using evidence-based and sustainable interventions. Several interventions have been developed based on scientific research, however, not all of them have proven to be sustainable or feasible in real-life contexts (e.g., in school, in gyms, at work). Some interventions may be resource-intensive, requiring substantial financial investments or time commitments, making them impractical for implementation. While others lack a clear theoretical framework or have limited evidence for effectiveness outside controlled lab-based environments. Therefore, it is important to develop new evidence-based interventions to reduce prejudice in real-life settings.

The current research will focus on evaluative conditioning-based interventions. These interventions involve the presentation of a target stimulus (e.g., a social group) with valenced stimuli (e.g., positive or negative words). These types of interventions have met a few successes in lab-based environments and mitigate some of the limitations that other interventions have. Notably, there is little research on these interventions in real-life contexts and the available evidence does not suggest good effectiveness. One potential reason could be that current interventions typically rely on a weak theoretical framework. This research will build and test a new intervention for prejudice reduction that is grounded in a newly emerging framework: the inferential framework. Specifically, this research will focus on prejudice within the context of obesity.

The following sections in this introduction will discuss (obesity) prejudice, including its contributors and detrimental effects. Additionally, different prejudice reduction interventions will be examined, as well as evaluative conditioning-based interventions and theories regarding the underlying processes. Finally, the current research and its hypotheses will be outlined, aiming to contribute to the advancement of knowledge and development of effective interventions to combat (obesity) prejudice in real-life contexts.

Obesity Prejudice

What is (Obesity) Prejudice?

There are multiple definitions of the term prejudice. The broad variety of definitions illustrates the intricate nature and complexity of the phenomenon. Prejudice can be defined as a negative bias or attitude toward a certain group of people (Paluck et al., 2021), or as an evaluative reaction that emerges in interaction between individual factors and social factors (Eagly, 2004). Additionally, prejudice can be implicit, occurring automatically and without the individual's awareness, or explicit, where it is consciously acknowledged and, when willing, openly expressed (Daumeyer et al., 2019; Mateo & Williams, 2020). Regardless of the used definition, Brown and Zagefka (2005, p. 54) emphasize two common aspects: 'prejudice is an intergroup phenomenon' and it implies that the ingroup (i.e., a group of people that share a common identity) is treated 'in some more favorable way than the outgroup' (i.e., a group of people that is perceived as different from the ingroup). Thus, prejudice often involves the perception of an 'us versus them' thinking, where individuals associate themselves with their own group (i.e., ingroup) and view members of other groups (i.e., outgroup) as different, even inferior. These attitudes are often associated with stereotypes (i.e., overgeneralized beliefs or assumptions about individuals based on their membership in a group; Kurdi et al., 2019; Peterson et al., 2016; Worthy, 2020) and may lead to prejudiced behavior, such as discrimination. Discrimination (i.e., prejudiced behavior) refers to actions directed toward a certain social group that result in disadvantages or harm inflicted upon the discriminated group (Altman, 2020; Mateo & Williams, 2020).

Prejudice in the context of obesity (i.e., a condition characterized by an excessive accumulation of fat, posing major health risks to individuals affected by it; World Health Organization: WHO, 2020) is a concerning issue across many societies (Brewis et al., 2018). Obesity prejudice can be described as a negative bias, attitude, or belief toward individuals with obesity[1] or who are perceived to be overweight (Alberga et al., 2016; Nutter et al., 2019; Styk et al., 2022), and entails making negative evaluations based on excessive body mass (Styk et al., 2022). For example, words like 'unmotivated', 'less intelligent', 'lazy', or 'unsuccessful' are often associated with people with obesity (Okumuşoğlu, 2016; Pearl et al., 2017). Furthermore, a number of studies indicate the prevalence of obesity prejudice across different life domains: employment (Zacher & Von Hippel, 2021), health care (FitzGerald et al., 2022; Brochu, 2020),

[1] This paper will be using description such as 'people or individuals with obesity' to avoid identifying people with their condition (e.g., 'obese people') and to ensure a person-first approach (Fisch et al., 2021; Fitch & Bays, 2022).

education (Nutter et al., 2019), sport and exercise (Thedinga et al., 2021), and interpersonal relationships (Carels et al., 2020; Schmidt et al., 2022). Considering its presence in various key areas, addressing both the factors contributing to obesity prejudice and its negative effects is important.

Underlying Contributors & Effects

Evidence shows the negative impact obesity prejudice has on a variety of facets in life. For example, under -or unemployment and unequal treatment policies (Brown et al., 2022; Campos-Vazquez & Gonzalez, 2020; Pearl, 2018), poorer physical/mental health and lower self-esteem (Guardabassi et al., 2018; Pearl et al., 2021; Udo et al., 2016), poorer social and academic outcomes (Puhl & Lessard, 2020), a decrease in physical activity and an increased risk of weight gain (Bevan et al., 2022; Major et al., 2014), discrimination in health care practices (Brewis et al., 2018; Forse et al., 2019; Tomiyama et al., 2018), a higher risk of self-intentional harm and suicidality (Daly et al., 2020; Van Vuuren et al., 2019; Sutin et al., 2018), and so on. It would be useful to investigate factors that may lead to these profound negative effects, to create a better understanding regarding the manifestation of obesity prejudice. The roots of obesity prejudice are multifaceted and can stem from various factors, such as (but not limited to) media portrayals, societal norms and cultural values, individual beliefs about health and body image.

Puhl et al. (2005) conducted a study to investigate the effects of perceived social consensus (i.e., the idea that one's attitudes, thoughts and actions are shared by others) on attitudes toward individuals with obesity. The findings suggest that the attribution of controllable causes (e.g., exercise habits or eating pattern) to, and the influence of one's perception of other's (negative) beliefs about people with obesity may contribute to this type of prejudice. For example, when people believe that negative stereotypes about obese individuals (e.g., 'Obese people are lazy') are widely accepted, they are more likely to endorse these stereotypes themselves. The researchers believe that providing education regarding the complex etiology of obesity may be helpful to reduce negative attitudes. Similar findings have been found in other studies (Haqq et al., 2021; Joslyn & Haider-Markel, 2019; Lin & Stutts, 2020; Pearl, 2018). However, other research suggests that providing information about weight controllability does not significantly affect the level of prejudice (Thorsteinsson et al., 2016).

The media (e.g., newspapers, blogs, websites, entertainment media) is an important environmental factor that may contribute to the manifestation of obesity prejudice. Some studies indicate the negative role it plays in the formation and distribution of obesity prejudice, for example, by promoting unrealistic social norms surrounding ideal body types or by portraying

overweight people in a negative manner (Marks et al., 2020; Monaghan et al., 2019; Puhl & Heuer, 2009; Selensky & Carels, 2021). While other studies highlight the positive contribution the media has on (changing) attitudes toward people with obesity, for example, by using the platform as an education tool to reduce weight-related biases (Sherf-Dagan et al., 2022; Styk et al., 2022). Nevertheless, using multimedia as a teaching and learning aid comes with barriers (e.g., lack of instructional content) that must be taken into consideration (Abdulrahaman et al., 2020).

Another influential environmental factor is our society (e.g., society's expectations, norms and values, policies). Each society has its own value system (i.e., a system of established values and related norms), and these cultural values may influence one's personal value system and activate negative stereotypes or attitudes (Crocetti et al., 2021). Western societies exhibit a person-centered orientation, emphasizing individual accountability for personal achievements and failures, with thinness being regarded as the prevailing beauty standard (Marks et al., 2020). This could promote the idea of seeing obesity and overweight as '(bad) individual choices', resulting in negative attitudes and prejudiced behavior (Robinson et al., 2020; Rodgers, 2016; Saguy & Gruys, 2010; Selensky & Carels, 2021). However, one can regulate this process and prevent or minimalize biased expression (Plant & Devine, 1998; Schmader et al., 2022).

Some studies suggest that emotions play a key role in prejudicial attitudes and related behavior (Pakpour et al., 2020; Powell & Consedine, 2021). For example, derived from a sociofunctional approach to prejudice, behaviors toward an outgroup are determined by emotions and perceived threats (Cottrell & Neuberg, 2005). Nevertheless, Aubé and Ric (2019) provided mixed support for this model, indicating that other factors, such as cognitive appraisals (i.e., a psychological process through which individuals evaluate and interpret events, situations, or stimuli in their environment to determine their significance and emotional impact; Lindquist, 2013) or social context, may also influence how emotions and perceived threats translate into prejudicial behavior.

The utilization of stigmatizing language or labels to describe individuals with obesity can be seen as both a contributor to and a consequence of (e.g., type of prejudiced behavior) obesity prejudice (Fisch et al., 2021). A systematic review, Puhl (2020), identified both qualitative and quantitative studies examining preferences for weight-related terminology. Consistent findings across studies indicate a preference for neutral words (e.g., 'unhealthy weight') rather than words like 'fat' or 'obese', that are often viewed as stigmatizing or blaming. Similar findings can be found in other studies (Fitch & Bays, 2022; Puhl & Himmelstein, 2018). However, there are mixed results regarding individual variation in language preference across socio-demographic

variables (e.g., ethnicity, gender, weight category; Puhl, 2020; Puhl et al., 2013). Furthermore, researchers advocate for the use of person-first language (i.e., language that places the person before the disease) to promote respectful language (Fisch et al., 2021; Pont et al., 2017).

In conclusion, multiple factors (e.g., beliefs, values, emotions) may play a role in the formation of obesity prejudice. Therefore, interventions aiming to reduce negative emotions and promote positive beliefs toward biased people are needed.

Prejudice Reduction Interventions

Taking a closer look at intervention studies, the review study by Paluck et al. (2021) identified four trends in terms of most commonly used types of interventions within the research domain of prejudice. First, interventions that use second-hand or imagined contact with outgroups. Second, interventions incorporating cognitive or emotional training, specifically targeting thinking and emotion regulation strategies. Furthermore, social categorization interventions (i.e., training individuals to prioritize common characteristics with outgroups). Finally, direct-contact interventions with outgroups. In addition to these trends, various other intervention approaches exist, for example diversity training (i.e., a program designed to promote positive intergroup interactions and collaborations) and antibias education (i.e., an educational approach that aims to reduce prejudice and discrimination and creates inclusive learning environments).

However, there are limitations regarding prejudice reduction interventions. Intergroup contact is useful, but some complexities should be taken into consideration: specific circumstances of contact situations, previous experiences and expectations, the risk of negative intergroup contact (Guffler & Wagner, 2017; Schäfer, Kauff, et al., 2021; Schäfer, Simsek, et al., 2021). In addition, people may exhibit resistance to persuasion-involved interventions, as such interventions tend to challenge their prior beliefs. For example, Requero et al. (2020) highlight the importance of confidence in (i.e., the level of confidence people have in the validity of their thoughts), and the valence (e.g., positive or negative) of their thoughts. When participants generated more negative thoughts, more confidence in those negative thoughts was associated with less persuasion. Fransen et al. (2015) categorize resistance strategies into avoidance (i.e., involves ignoring or minimizing exposure), contesting (i.e., involves actively counter-arguing or challenging the persuasive message), and empowerment (i.e., involves strengthening one's own beliefs or attitudes, increasing confidence in them), driven by motives such as maintaining autonomy, identity, and social connections. Therefore, these factors should be considered when

working with persuasion-based interventions. Fortunately, evaluative conditioning interventions may help with these limitations.

Evaluative Conditioning

What is Evaluative Conditioning?

Evaluative conditioning (EC) is a perceived change in liking or preference (i.e., an effect) as a result of the repeated pairing of stimuli (i.e., a procedure) (De Houwer, 2007). For example, 'have-a-Coke-and-smile' ads of the Coca-Cola Company. The liking of this brand may increase because of the repeated pairing of the Coke brand name (i.e., *conditioned stimulus*: CS) with pictures of smiling people (i.e., *unconditioned stimulus*: US). In other words, the evaluation of the CS may become more positive when it has been paired with a positive US (Moran, Nudler, et al., 2022).

Rather than a specific procedure or a theoretical process, EC is best described as an effect (i.e., result of a procedure). According to De Houwer (2007), one advantage is that it allows one to have clear criteria for determining the presence of EC effects. This is only possible if studies include appropriate control and experimental conditions, in which the used procedure (i.e., the way of pairing the stimuli) is the only difference between those conditions. Another advantage is that it allows openness for diverse theoretical perspectives about the explanatory processes underlying EC effects (i.e., changes in liking).

The Theoretical Processes Underlying Evaluative Conditioning Effects

One dominant perspective regarding the underlying process responsible for EC effects is association formation. Associative models involve low-order cognitive processes that rely on the automatic formation of associative links, between mental representations (De Houwer, 2007; Hofmann et al., 2010; Moran, Hughes, et al., 2022; Moran, Nudler, et al., 2022), under the Hebbian principle (i.e., neurons that fire together, wire together; Lim, 2021). For example, due to the repeated pairing of the Coke brand name with pictures of smiling people (i.e., CS-US co-occurrence), an associative link is formed between the mental representation of the Coke brand name (i.e., the CS) and the mental representation of pictures of smiling people (i.e., the US) or the evaluative response to these pictures when encountering the Coke brand name (Moran, Nudler, et al., 2022). Thus, by pairing a stimulus with a valenced event (e.g., a performance or a presentation of a valenced stimulus) it will create a mental association between the two

representations and will lead to automatic changes in stimulus evaluations (Van Dessel et al., 2019).

On the contrary, a second perspective is that of propositional models, in which the fundamental assumption is that an EC effect only occurs if a proposition (i.e., 'a mental representation that contains information about the nature of the relation between stimuli' (De Houwer, 2018, p. 3)) has been made. Propositions are the result of integrating propositional inputs derived from diverse sources of information. Furthermore, awareness of the CS-US co-occurrence (i.e., '*contingency awareness*') is required for the construction of propositions (De Houwer, 2018; Moran, Nudler et al., 2022). Therefore, EC effects are due to the non-automatic application of consciously acquired propositional knowledge concerning a specific type of relation between two stimuli. This acquired knowledge is utilized to evaluate a stimulus present in that specific relation (Hofmann et al., 2010; Moran, Nudler, et al., 2022). Propositions regarding stimulus relations can undergo evaluation (e.g., as being true or false) and allow making inferences.

According to Van Dessel et al. (2019), an inference can be described as a proposition constructed on the basis of available and activated information (e.g., through observation or prior knowledge) within a person's mental model of the world (i.e., '*inferential reasoning*'). Within the inferential framework, EC effects can be described as resulting from inferential processes when people observe the co-occurrence of CSs and USs. For example, when people observe a biased person co-occur with a positive US, they make inferences about the relationship between them, leading to reasoning results such as 'this person must also be positive; otherwise, they would not appear together'. Under the inferential framework, this implies that individuals have the capacity to develop positive beliefs or emotions toward biased individuals through inferences that derive from the EC procedure. Therefore, promoting inference processes (e.g., by adding inferential cues or goal-related cues) may lead to more pronounced effects on prejudice-related behavior and attitudes. When following this perspective, EC interventions that include inference-based processes could be a promising tool to change attitudes and behaviors (Van Dessel et al., 2019; Bartolo & Averbeck, 2021; Moran, Nudler, et al., 2022; Van Dessel et al., 2022).

Evaluative Conditioning-Based Interventions and Their Effectiveness

The current evidence regarding the effectiveness of EC interventions is inconsistent (Moran, Nudler, et al., 2022), highlighting the complexity and variability of results. Some studies have reported significant changes in evaluations and behavior following EC interventions. For example, changes in drinking behavior (Houben et al., 2010) and explicit attitudes (Zerhouni et

al., 2019), improvement in interpersonal relations (Li et al., 2021), and changes in implicit attitudes (Hollands et al., 2011; Jeon et al., 2019). While other studies have presented limited or no significant effects, for example, no changes in implicit preferences for and the consumption of unhealthy food (Masterton & Jones, 2023), no influence on action tendences toward alcohol (Zerhouni et al., 2019) or implicit evaluations of alcohol (Tello et al., 2020), and no changes in infants' preferences for certain objects (a longitudinal study by Doyle et al., 2022).

Furthermore, a meta-analysis conducted by Hofmann et al. (2010), that examined 214 studies on EC, found a moderate effect size $d = .52$ (i.e., Cohen's *d*; standardized mean difference score), with a 95% confidence interval of [0.47,-0.58]. Certain procedural characteristics moderated EC effects, such as stronger effects were reported with high contingency awareness, supraliminal US presentation (i.e., the US presentation is above the threshold of conscious awareness and is perceivable for participants), post-acquisition procedures (e.g., the CS evaluation after it has been paired with a valenced US), and when self-report measures were used. However, there were limitations, including a lack of consistency (e.g., differences in the operationalization of EC across studies), limited available evidence for the impact of certain moderators, and methodological issues (e.g., a variation in the procedures). Therefore, findings should be interpreted within these constraints.

Other studies have investigated effects of EC on underlying processes (e.g., associations, control-oriented processes). Calanchini et al. (2020) examined the process-level effects of 17 implicit bias reduction interventions, including EC interventions. Results indicate that EC interventions only had an impact on control-oriented processes (e.g., motivation, regulation, inhibition), which reflected changes in implicit preferences. Similar conclusions can be found in a study of Lai et al. (2014). However, no consistent reduction of explicit preferences was found across different interventions (including EC interventions).

A limited number of studies have implemented EC interventions in real-life contexts. For example, a study by Conroy and Kim (2021) used a smartphone-based EC intervention to improve (affective judgements of) physical activity. EC was implemented by pairing neutral images (e.g., images of people working out (*CS*)) with pleasure-inducing images (e.g., dog images (*US*)) displayed as background wallpapers on participants' lock screens. The study demonstrates the feasibility of integrating EC interventions into the context of daily life, as well as the effectiveness of EC interventions on behavioral changes (e.g., increased physical activity). Nevertheless, results should be carefully interpreted due to the small sample size and the lack of a rigorous experimental design. A similar study (Kosinski, 2019), that tested the impact of an app-based EC intervention on body image, found no support for the notion that EC was

responsible for the decrease in body dissatisfaction as well as the increase in self-esteem after the intervention (i.e., effects were similar in both EC and neutral condition).

In contrast to these results, a study conducted by Martijn et al. (2010) yielded different results regarding the impact of EC (e.g., using social stimuli: pictures of smiling, neutral, or frowning faces) on body satisfaction. Specifically, findings suggest an improvement of body satisfaction and global self-esteem among women with high body concern. However, a replication study conducted by Glashouwer et al. (2019) found no evidence regarding the effectiveness of an EC procedure on body satisfaction or self-esteem. In addition, the EC procedure resulted in a change in CS valence (e.g., participant in the experimental condition evaluated their body picture as more positive and the control pictures as more negative, after the training, compared to the control group). Nevertheless, this effect was small (see Glashouwer et al., 2019, p. 7) and did not differ between individuals with high and low body concern.

In conclusion, mixed findings can be found regarding the effectiveness of EC interventions in research. Moderators such as methodological variations (e.g., the design, sample characteristics, outcome measures, materials), contextual factors (e.g., the presence of competing stimuli, contextual cues), and individual differences (e.g., prior experiences, beliefs, cognitive processes) may be responsible for the inconsistency in results, however, more research is warranted (Moran, Nudler et al., 2022). The evidence underscores the complexity of EC interventions and the need for further research to examine the conditions under which these interventions are most effective. Moreover, it is important to be aware of the limitations present in these studies (e.g., methodological issues, small sample and effect sizes, a lack of a rigorous experimental design, and demand characteristics effects; see Moran, Nudler et al., 2022) as they may impact the reliability and generalizability of the findings. Therefore, results should be carefully interpreted within these constrains. In addition, the majority of EC interventions have been conducted in controlled laboratory settings, with limited research conducted in real-life contexts. Hence, the need for more research in naturalistic environments. Moreover, there is a limited amount of EC research in literature targeting the reduction of obesity prejudice. While the current literature provides insights into a variety of phenomena (such as body image and related constructs), further exploration regarding EC within the context of obesity is warranted to enhance our understanding of effective prejudice reduction interventions.

Current Study

The literature has shown that obesity prejudice continues to be a prevalent issue, with individuals facing stigmatization and biased treatment based on their weight. This issue is

multifaceted and has detrimental effects on different aspects of individuals' lives, as discussed in the 'Underlying contributors & effects' section, including employment, physical and mental health, and even the risk of self-harm and suicidality. Moreover, it seems important to develop novel interventions that are easy to implement in real-life settings, particularly in sport environments where obesity prejudice is likely prevalent (Boudreault et al., 2022; Greenleaf et al., 2012; Thedinga et al., 2021). Hence, the focus of our study: the mitigation of prejudice directed toward individuals who are perceived to be obese or overweight[2] within the environment of a gym, a context in which healthy weight and appearance are important (Pallotto et al., 2022; Voelker et al., 2022).

The current study will develop a novel evaluative conditioning (EC)-based intervention, particularly a poster, grounded in the inferential framework. The main objective of this study is to examine the potential impact of an inferential EC-based poster[3] (i.e., experimental condition) on (1) explicit prejudiced beliefs (e.g., negative stereotypical beliefs) and (2) the evaluation (e.g., as more positive or negative) of individuals perceived as obese or overweight, compared to a traditional EC-based poster[4] (i.e., control condition). Beliefs play a role in the formation of evaluative reactions or attitudes (Kite et al., 2022; Kurdi et al., 2019; Worthy, 2020). When individuals experience a shift in their beliefs due to new information or experience, it may influence their overall attitude. For example, if someone has positive experiences with certain people, their beliefs about those people may become more positive, influencing one's overall attitude and behavior. This study will target two stereotypical beliefs: 'Overweight people are lazy' and 'Overweight people lack motivation to exercise', identified as common stereotypes of overweight individuals (see Davison & Birch, 2004; Greenleaf et al., 2008; Puhl & Heuer, 2010; Wang et al., 2004). Despite the potential benefits of EC-based interventions, their effectiveness in gym settings remain uncertain. Literature also suggests a limited amount of research on inferential reasoning in real-life contexts targeting (obesity) prejudice, highlighting the need for further investigation. Furthermore, some studies have examined the effectiveness of using (online) posters (for example, see Alsalihi, 2020; Hasanica et al., 2020; Ilić & Rowe, 2013; Oronje et al., 2022). These studies indicate that posters, including online formats, can be highly effective tools for engaging audiences and conveying information. Their effectiveness is

[2] The focus is on the perception of weight (i.e., perceiving one as obese or overweight) rather than solely relying on factual information (i.e., the presence of an obesity diagnosis).
[3] A poster grounded in the evaluative conditioning (EC) and the inferential framework. This *inferential EC-based poster* will be used in the experimental condition.
[4] A poster grounded in evaluative conditioning. 'Traditional' refers to the common or standard EC (see section 'What is evaluative conditioning?' for more information). This *traditional EC-based poster* will be used in the control condition.

enhanced by good design, clear content, and proper use alongside other methods. Moreover, there are varying degrees of effectiveness depending on factors like design quality, content depth, and the context in which they are used. However, research on the effect of posters in reducing obesity prejudice remains limited. By implementing a feasible inferential EC-based intervention (e.g., a poster) in a natural setting (e.g., the gym) targeting obesity prejudice, we may enhance our understanding regarding potential benefits and limitations of this approach, and lay a foundation for future studies to expand and refine our research findings. Moreover, via an innovative intervention grounded in scientific research we may promote more inclusivity and body positivity, reduce stigma, and strive for a more accepting context. In order to establish causal relationships as well as enhance the predictive power of the findings, more rigorous research is needed such as randomized controlled trials, quasi-experimental or longitudinal designs.

A Novel Intervention

For the purpose of this study, the researchers have created two posters: an inferential poster and a control poster, both grounded in evaluative conditioning, in which a target stimulus (i.e., a man and woman who are perceived to be overweight) is being paired with positive stimuli. The poster used in the experimental condition (i.e., the inferential poster) included target stimuli engaged in different physical exercises. These images were paired with a positive stimulus: text on their t-shirts saying ‘I love/heart-symbol fitness’. Additionally, a sentence next to the target stimulus, ‘Sporten is onze passie’ (which translates to ‘Exercising is our passion’), was included to clarify the relation between the pairings and promote inferential processes (i.e., ‘relational clarity’: providing extra information that clarifies the relation that the pairings signify and what participants need to infer from the poster). The poster used in the control condition featured the same target stimuli (i.e., the same people with the same facial expressions) paired with different kinds of positive stimuli: t-shirts that displayed images such as rainbows, smiley faces, and the same amount of heart-symbols and the word ‘love’ as in the inferential poster, ensuring that associative processes cannot explain a potential effect of the condition. No additional sentence was added in the second poster. A total of six images were implemented in both posters (i.e., three pictures of a woman, one of a man, and two couple pictures) ensuring repeated US-CS pairings.

Research Questions and Hypotheses

The first research question (**RQ1**) is *whether an inferential EC-based poster has an effect on explicit prejudiced beliefs (e.g., stereotypical beliefs about laziness and lack in motivation) toward individuals perceived as obese or overweight?* Based on the inferential EC theory (Van Dessel et al., 2019), (**H1a**) we predict a significant reduction in the stereotypical beliefs (i.e., 'Overweight people are lazy' and 'Overweight people lack motivation to exercise') in the experimental condition after the intervention. Since we have no clear predictions based on the theory, there is no a priori hypothesis regarding the effect of the traditional EC-based poster (i.e., the control group) on stereotypical beliefs. Its effect will be examined in this study. Additionally, (**H1b**) according to the theory, we expect a greater reduction (with an expected effect size smaller than d = 0.50) in the experimental condition compared to the control condition after the intervention, since the inferential EC-based poster may target relevant inferences more directly.

A second research question (**RQ2**) explores *whether an inferential EC-based poster has an effect on the evaluation of individuals perceived as obese or overweight?* Given the exploratory nature of our study, we do not have clear hypotheses regarding the effects of the traditional and inferential EC-based poster on the evaluation of the target stimulus. Based on a review study by Moran, Nudler, et al. (2022), EC effects often occur when stimuli are paired with affective stimuli, leading to changes in how those stimuli are evaluated. However, the studies referenced in this review were primarily conducted in controlled, non-real-life settings, which means the real-world applicability remains uncertain. Furthermore, we do not have a hypothesis about the difference in effect on the evaluation between the experimental and control group. This will be further examined in the study.

Methods

Participants

A total of 131 participants were recruited for this study. Participants were recruited on-site upon entering the gym setting. Participants were recruited across four days (on Monday, Tuesday, Wednesday and Thursday) in July 2024. Inclusion criteria were: 1) age 18 and older; 2) sufficient comprehension of the Dutch language (i.e., the ability to speak and understand); 3) possession of a gym membership (i.e., visitors of the gym); and 4) they indicated not to have attended the gym on previous days during which the study had run. They were approached by a (female) researcher and were asked if they were willing to take part in a study conducted by a master's student from Ghent University. participants had the opportunity to win a €10 Bol.com gift voucher upon completing the study. The gift voucher served as an incentive for participants to complete the study.

Prior to the data collection, we used the software program G*Power (Faul et al., 2007) to conduct a power analysis and determine the sample size. Our goal was to obtain 80 % power to detect a medium effect size $d = 0.50$ at the standard .05 alpha error probability. We did not have strong reasons to expect a specific effect size in this study given that there has been no research on this topic. However, large effects are unlikely with these types of real-life studies. Also, given that we were conducting an intervention in a real-life setting, obtaining a large sample was impractical and a very small effect might not weigh up to intervention costs of real-life implementation, so powering for very small effect sizes was not feasible. For this reason, we powered the study for a medium between-subjects effect of $d = 0.50$, according to conventional benchmarks (Cohen, 1988). For the experiment, in order to achieve 80 % power to observe a medium effect of $d = 0.50$ for a difference between the two conditions (i.e., experimental and control) in a one-tailed between-subjects t-test at alpha = .05, at least 102 participants were needed (i.e., 51 participants in each condition). In order to have the same power of 80 % with a medium effect of $d = 0.50$ at alpha = .05 in a one-tailed within-subjects t-test, at least 27 participants in each condition were required. We aimed for 102 participants after exclusions and stopped the recruiting process at the end of the fourth day, reaching a total of 131 participants, which is 28.43 % more than our initial goal and should therefore be sufficient even after exclusions. All data were collected at once and data analyses were done afterwards.

The data was excluded of participants who met the following criteria: 1) failure to complete the second questionnaire (22 participants; i.e., 16.79 %); 2) they did not indicate seeing the poster (0 participants; i.e., 0 %) or did not report anything that was actually in the poster for the poster question (2 participants; i.e., 1.53 %); 3) they indicated being demand

compliant/reactant participants (1 participant; i.e., 0.76 %); or 4) they provided incorrect participation codes (2 participants; i.e., 1.53 %). The exclusion criteria were set for the following reasons: incomplete data would hinder the ability to answer the research questions; content awareness is necessary to potentially observe an EC effect; response integrity is necessary to ensure that responses reflect genuine opinions or beliefs; and correct codes were necessary to link the data. The final sample of participants consisted of 104 individuals (i.e., 51 participants in the experimental condition and 53 participants in the control condition), comprising 70 males (i.e., total sample: 67 %; experimental condition: 69 %; control condition: 66 %) and 34 females (i.e., total sample: 33 %; experimental condition: 31%; control condition: 34 %) with an age range between 18 and 56 years (total sample: M = 26.43, SD = 7.48; experimental condition: M = 26.80, SD = 7.76; control condition: M = 26.08, SD = 7.26).

The study was conducted according to the guidelines of the General Ethical Protocol of the Faculty of Psychology and Educational Sciences (Ghent University)[5] and in accordance with accepted standards for scientific and ethical behavior. The researchers adhered to good research practices and followed the principles of research ethics as described in 'Ethics in Social Science and Humanities' (EU, 2018)[6]. Furthermore, all participants provided written informed consent prior to participation and were informed of the study procedure and purpose, potential risks and benefits, confidentiality, the storage of the data, their rights, and the contact information (see Appendix 1). Prior to this study, an online Data Management Plan (see Appendix 2) and a General Data Protection Regulation (see Appendix 3)[7] form were created to outline the management and sharing of data while ensuring the protection of participants' personal information. These documents were regularly updated.

Additionally, other documents and files, including a Data Analysis Plan (see Appendix 4), study procedure, research questions and hypotheses, information and informed consent forms, and questionnaires (see Appendix 5) were preregistered on the Open Science Framework (OSF)[8] prior to the collection of the data. The data was also shared on this platform. Importantly, all information shared on this platform was anonymized, ensuring that the identity of the participants could not be traced. Personal data that could have potentially led to the identification of the participants (e.g., gender and age) were collected separately from the responses on the questionnaires. Only the researchers involved in this study had access to the personal data. The data was deleted once the analyses were completed.

[5] https://www.ugent.be/pp/nl/onderzoek/ec#Regelsenprotocollen
[6] https://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020_ethics-soc-science-humanities_en.pdf
[7] See https://dmponline.be
[8] See https://osf.io and for the preregistration, see https://doi.org/10.17605/OSF.IO/NDVGS.

Design

The current study is a field experiment and uses a mixed design with one between-subjects factor (i.e., condition/group) with two levels (i.e., experimental condition: participants were exposed to an inferential EC-based poster *vs.* control condition: participants were exposed to a traditional EC-based poster), and one within-subjects factor (i.e., time) with two levels (i.e., pre- vs. post-intervention). Each participant was either in the experimental condition if they came to the gym when an inferential EC-based poster was presented in the gym or the control condition if they came to the gym when a traditional EC-based poster was presented in the gym. The assignment of the conditions was predetermined (on Monday and Thursday, from 3.30 p.m. till 10 p.m. the inferential EC poster; on Tuesday and Wednesday, from 3.30 p.m. till 10 p.m. the traditional EC poster). The participants were not informed about different conditions.

Materials

Posters

Two types of posters were created by the researcher for this study (see Appendix 6): an evaluative conditioning-based poster designed to promote specific inferences related to working out (used in the experimental condition) and a traditional evaluative conditioning-based poster (used in the control condition). Both posters were created using Canva[9] and were formatted to size 670 mm x 950 mm. The images featured in the posters were available for free use and distribution (for the description of the posters see previous section 'A novel intervention'). The researcher used search terms such as 'Overweight people working out', 'Overweight couple exercise', 'Smiley', 'Rainbow', 'Hearts' and 'Canva fitness shapes' to find suitable stimuli.

Questionnaires

Two online questionnaires were developed (see Appendix 5) for the pre- and post-measurement respectively. These questionnaires were designed by the researchers and implemented online via lab.js[10]. The data was recorded and saved in the researcher's online website storage. The first questionnaire consists of six items: questions about the unique participation code (in order to match the pre- and -post measurement data) and demographic aspects (e.g., age and gender), two statements targeting stereotypical beliefs ('Overweight people are lazy' and 'Overweight people lack motivation to exercise'), and a question about the

[9] A free-to-use online graphic design tool, see https://www.canva.com.
[10] See https://lab.js.org.

evaluation of the target stimulus (i.e., people who are overweight). At the end of the questionnaire, participants were informed that they would see a poster at the gym and were reminded to complete the second questionnaire upon leaving the gym and that they would have a chance to win a prize for completing the study. The second questionnaire consists of nine items: questions about the unique participation code and demographic aspects (e.g., age; to verify if the participation code was correct), two statements targeting stereotypical beliefs, an evaluation question, questions about the poster and about demand compliance or reactance.

For the measurement of beliefs and evaluation, 5-point Likert scales were used, which allowed participants to indicate their level of agreement (1 = completely disagree; 2 = rather disagree; 3 = neutral; 4 = rather agree; 5 = completely agree) or their level of evaluation (1 = completely negative; 2 = rather negative; 3 = neutral; 4 = rather positive; 5 = completely positive). The other questions involved open-ended items (e.g., regarding the content of the poster) and closed items that required selecting from predetermined options (e.g., yes-no, indicating one's age or gender, or whether the participant was demand compliant). Since the questionnaires were developed by the researchers, their validity and reliability have not been formally established.

Other Materials

To access the information and informed consent form, as well as the online questionnaires, two QR codes were generated using me-qr.com[11]. These QR codes were printed on flyers created with Canva (e.g., the same design was used for both flyers; see Appendix 7). Furthermore, the participants got the chance to win a prize, therefore, a jar filled with cards (e.g., blank and winning cards) was created and used. Additionally, a list with unique participation codes was used in the study (see Appendix 8). This list comprised four columns: the participation code, the participant's name, the condition to which the participant was assigned (i.e., control or experimental), and whether the participant has completed the study.

Procedure

General Information

The study was conducted in the same gym across four days (from Monday till Thursday) from 3.30 p.m. till 10 p.m. Prior to the study, researchers inquired about the peak attendance days to ensure enrollment of at least 102 participants (i.e., 51 participants per condition).

[11] See https://me-qr.com.

Moreover, to select a gym, the researcher visited six gyms that were easily accessible. One of these gyms (i.e., a private gym) agreed to participate and provided their informed consent by reading and signing an informed consent form (see Appendix 9). On the first and fourth day of the study, the inferential EC-based poster (i.e., experimental condition) was implemented. On the second and third day, the traditional EC-based poster (i.e., control condition) was implemented. Both conditions followed the same procedure. Furthermore, the study was conducted in Dutch, including the instructions, the content of the posters, information and informed consent form and the questionnaires. The participants accessed all relevant document through QR codes, which were printed on flyers. During the study, the (female) researcher positioned themselves near the gym entrance/exit and the poster was displayed next to the exit of the gym facility (see Appendix 10 for a diagram of the layout and poster placement).

The Experiment

From Monday till Thursday (from 3.30 p.m. till 10 p.m.), participants were recruited on the spot as they entered the gym. They received the first QR code from the researcher with a link to the information and informed consent form, and the first questionnaire. Additionally, the participants received an unique participation code from the list and the researcher wrote down the names and the type of condition next to the corresponding code. They then scanned the QR code with their smartphone if possible (alternatively, the researcher's smartphone) and completed the two digital forms and the first questionnaire. At the end of the questionnaire, they received online instructions to proceed with their fitness activity and watch the (inferential EC) poster at a self-chosen time. Upon leaving the gym, participants were verbally reminded to complete the second questionnaire and, if they had forgotten, to look at the poster before filling out the final questionnaire. They then received a second QR code from the researcher, which they needed to scan with their smartphone to access the second questionnaire. Additionally, the researcher would remind them of their unique participation code and cross their name off the list. After completing the second questionnaire, the participants had the opportunity to draw a card from the jar for a chance to win a €10 voucher. The winning cards were predetermined and randomly placed in the jar (e.g., which was located next to the researcher) beforehand. If a participant drew one of the winning cards, they won a prize. Furthermore, when recruiting participants on the second, third and final day, the researcher asked an additional question to determine if they had already participated in the study on previous days. If they answered 'yes', they met the exclusion criteria and were excluded from the study.

Statistical Analysis

All analyses were conducted in R 4.4.1 (R Core Team, 2024). Firstly, we cleaned the data by removing all entries that met the exclusion criteria (e.g., dropouts, incorrect participation codes, incorrect answers on the poster question). We then performed preliminary analyses, including descriptive analyses and verifying the necessary assumptions prior to conducting the main analyses.

Dependent variables were the ratings for the two self-reported stereotypical beliefs (i.e., 'To what extend do you agree with the statement that 'Overweight people are lazy' and 'Overweight people lack motivation to exercise?') and the evaluation of the target stimulus (i.e., 'How positively or negatively do you evaluate people who are overweight?').

For the first research question (**RQ1**), we conducted confirmatory analyses performing a one-tailed paired t-tests checking if there was a significant reduction in the two stereotypical beliefs in the experimental group after the intervention (**H1a**), and a one-tailed independent t-tests checking if the reduction was significantly greater in the experimental group compared to the control group (**H1b**). Moreover, an exploratory analysis was conducted to test the potential reduction in the stereotypical beliefs in the control condition. For this analysis we did not have specific a priori hypotheses. For all the analyses, Cohen's *d* and achieved statistical power was reported (using G*Power) along with Bayes Factors (using the *ttestBF* function from the R package *BayesFactor*; Wagenmakers, 2007), with a prior of the effect size that we expected at the start (i.e., the alternative hypothesis was modeled using the prior with a scale factor of r = 0.50). Next, as an exploratory analysis of the second research question (**RQ2**; we did not have directed hypotheses), we performed separate within- and between-subjects t-tests examining if there was a significant change in the evaluation post-intervention in both groups, and if there was a significant difference in change between the experimental and control group.

Results

Preliminary Analyses

Table 1 presents the mean scores and standard deviations for pre- and post-intervention ratings on two stereotypical beliefs ('Overweight people are lazy' and 'Overweight people lack motivation to exercise') and the evaluation of the target stimulus (i.e., overweight people). The three outcome variables were measured using a 5-point Likert scale (with 1 being 'completely disagree' or 'completely negative', and 5 being 'completely agree' or 'completely positive'; for more information see section 'Questionnaires'). There was no significant difference in the pre-intervention scores between the two conditions, ts<, ps<.

Table 1

Mean Scores and Standard Deviations for the Three Outcome Variables

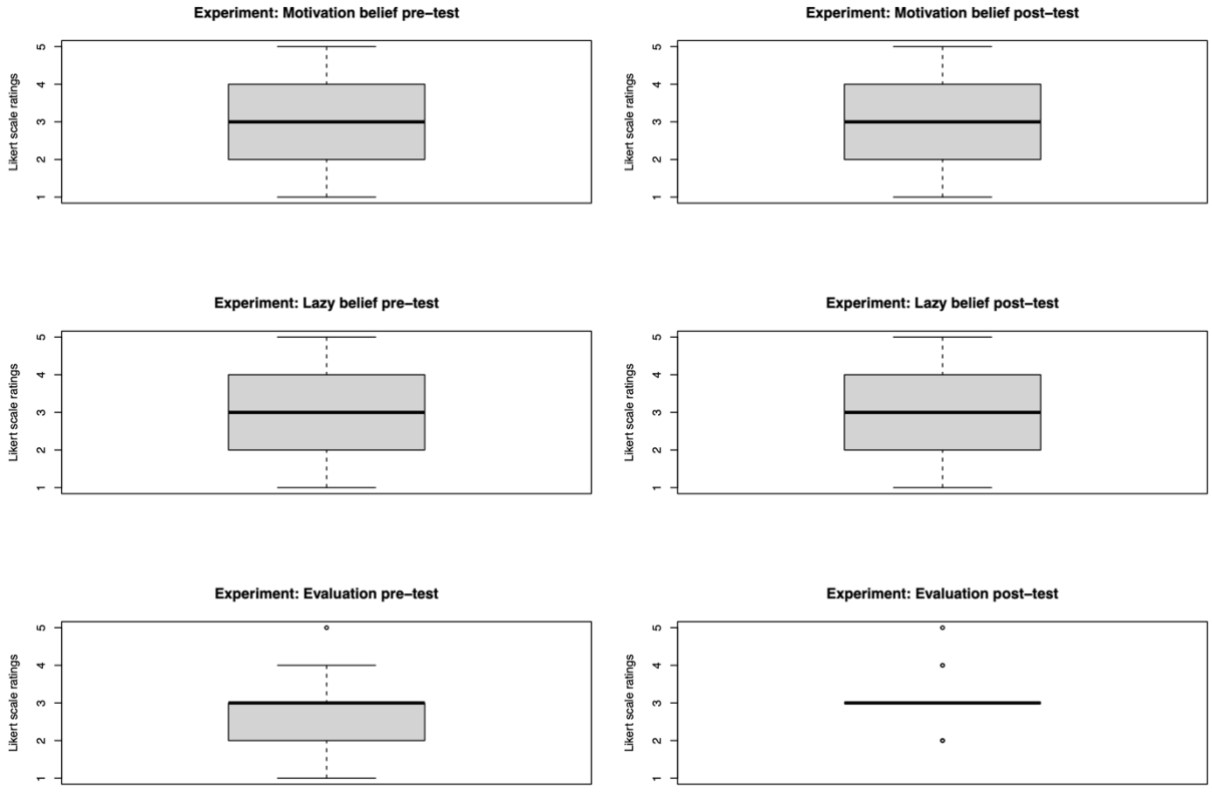
Outcome variable	Experimental condition				Control condition			
	Pre-intervention		Post-intervention		Pre-intervention		Post-intervention	
	Mean (*M*)	Standard Deviation (*SD*)	Mean (*M*)	Standard Deviation (*SD*)	Mean (*M*)	Standard Deviation (*SD*)	Mean (*M*)	Standard Deviation (*SD*)
First belief: *'Overweight people are lazy'*	2.98	1.17	2.71	1.08	3.09	1.32	3.02	1.12
Second belief: *'Overweight people lack motivation to exercise'*	2.80	1.13	2.75	1.09	3.36	1.15	3.26	1.18
Evaluation	2.75	0.84	2.98	0.65	2.75	0.87	2.75	0.90

Note. Mean scores and standard deviations for the pre- and post-measurement ratings on a 5-point Likert scale (1 = 'completely disagree' or 'completely negative', 5 = 'completely agree' or 'completely positive') for the two stereotypical beliefs and the evaluation of the target stimulus (i.e., individuals who are overweight).

Figure 1 illustrates the boxplots of the 5-point Likert scale ratings for the three outcome variables, both before and after the intervention in the experimental condition. The boxplots for the first and second outcome variables, respectively, reveal symmetrical distributions. Both pre- and post-test ratings for these beliefs show a median rating of 3 (Q2), with the interquartile range (IQR) extending from 2 (Q1) to 4 (Q3). The overall range of ratings spans from a minimum of 1 to a maximum of 5, with no outliers present. Notably, the boxplot for the evaluation outcome in the pre-test displays a different distribution of the ratings, with a median of 3, an IQR from 2 to 3, and an overall range from 1 (minimum rating) to 4 (maximum rating). Additionally, we observe one outlier with a rating of 5 in the pre-test measurement. Furthermore, the final boxplot of the evaluation variable shows a distribution centered around the rating of 3 (Q1, Q2 and Q3) with three outliers (e.g., a rating of 2, 4 and 5).

Figure 1

Boxplots: Pre- and Post-test Likert Scale Ratings on the Outcome Variables in the Experimental Condition

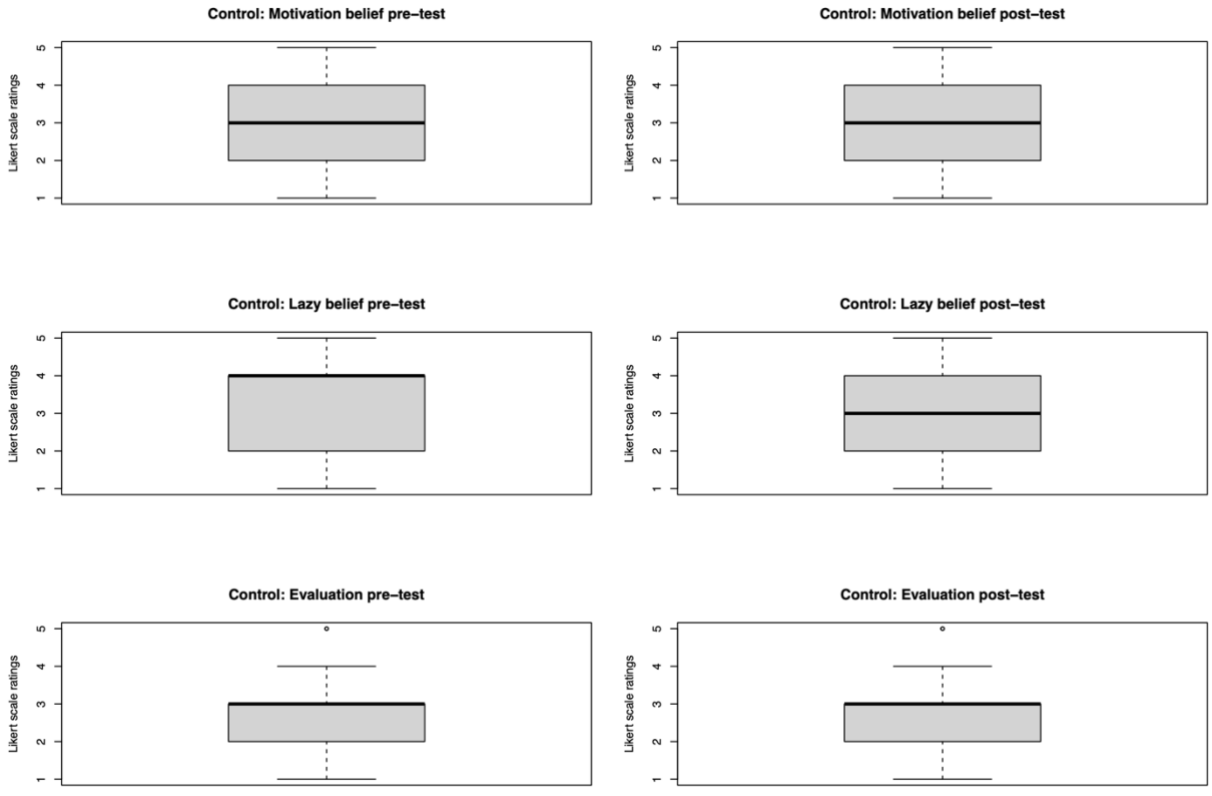


Note. Distribution of the Likert scale ratings (ranging from 1 to 5; for more information see 'Questionnaire' section) on the three outcome variables in the experimental condition.

Figure 2 presents the boxplots of the 5-point Likert scale ratings for the three outcome variables, both before and after the intervention in the control condition. The boxplots for the first outcome variable display a symmetrical distribution around the mean rating of 3 (Q2), with an IQR from 2 (Q1) to 4 (Q3), and a minimum rating of 1 and a maximum rating of 5. The ratings in the pre-test for the second outcome variable show a mean rating of 4 (Q2) and a IQR from 3 (Q1) to 4 (Q3). The post-test ratings present a symmetrical distribution around 3 (Q2). Additionally, there are no outliers in both outcome variables in the pre- and post-test. Furthermore, the third outcome variable, both in the pre- and post-test, show a mean rating of 3 (Q2), an IQR from 2 (Q1) to 3 (Q3), and a minimum rating of 1 and a maximum rating of 4. One outlier (rating of 5) can be seen in the boxplots.

Figure 2

Boxplots: Pre- and Post-test Likert Scale Ratings on the Outcome Variables in the Control Condition

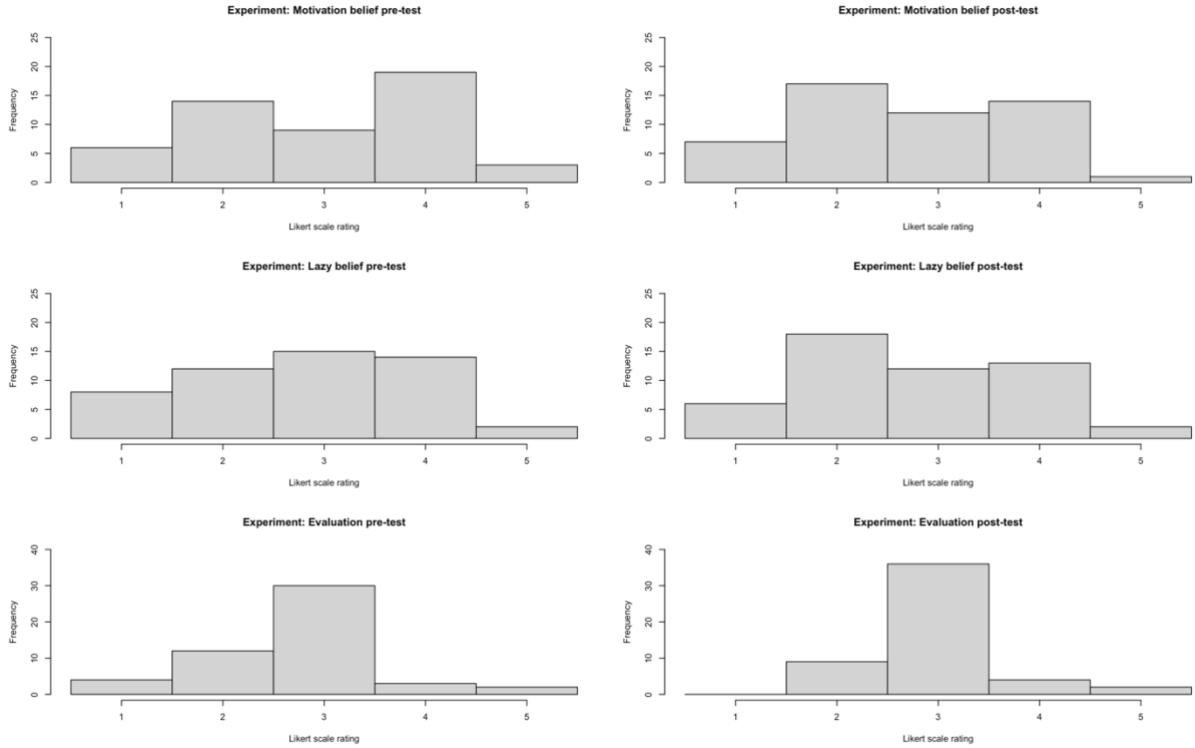


Note. Distribution of the Likert scale ratings (ranging from 1 to 5; for more information see 'Questionnaire' section) on the three outcome variables in the control condition.

Figure 3 provides a graphical representation of the distribution of the pre- and post-test Likert scale ratings on the three outcome variables in the experimental condition, showcasing the frequency of the data points within specified bins. The first histogram illustrates that the majority of participants rated at 2 and 4 in the pre-test measurement with relatively lower frequencies at the extreme ratings (1 and 5), indicating a potential bimodal distribution. The histogram of the post-test measurement of the first outcome variable shows a shift in the distribution compared to the pre-test, with the majority of ratings still clustered around 2 and 4, but with an increase in the frequency of rating 2 and a decrease in the frequency of rating 5. Furthermore, the distribution in the pre-test of the second outcome variable reveals a more evenly spread distribution with the highest frequency at rating 3. The post-test ratings distribution suggests a notable increase in the frequency of rating 2, but the distribution remains relatively spread out around ratings 2 and 3. For the third outcome variable, the distribution suggests a central tendency around rating 3, with a slight left skew. The frequencies are relatively lower at ratings 1, 4, and 5. The post-test distribution shows a central tendency around rating 3, with an absence of rating 1.

Figure 3

Histograms: Pre- and Post-test Likert Scale Ratings on the Outcome Variables in the Experimental Condition

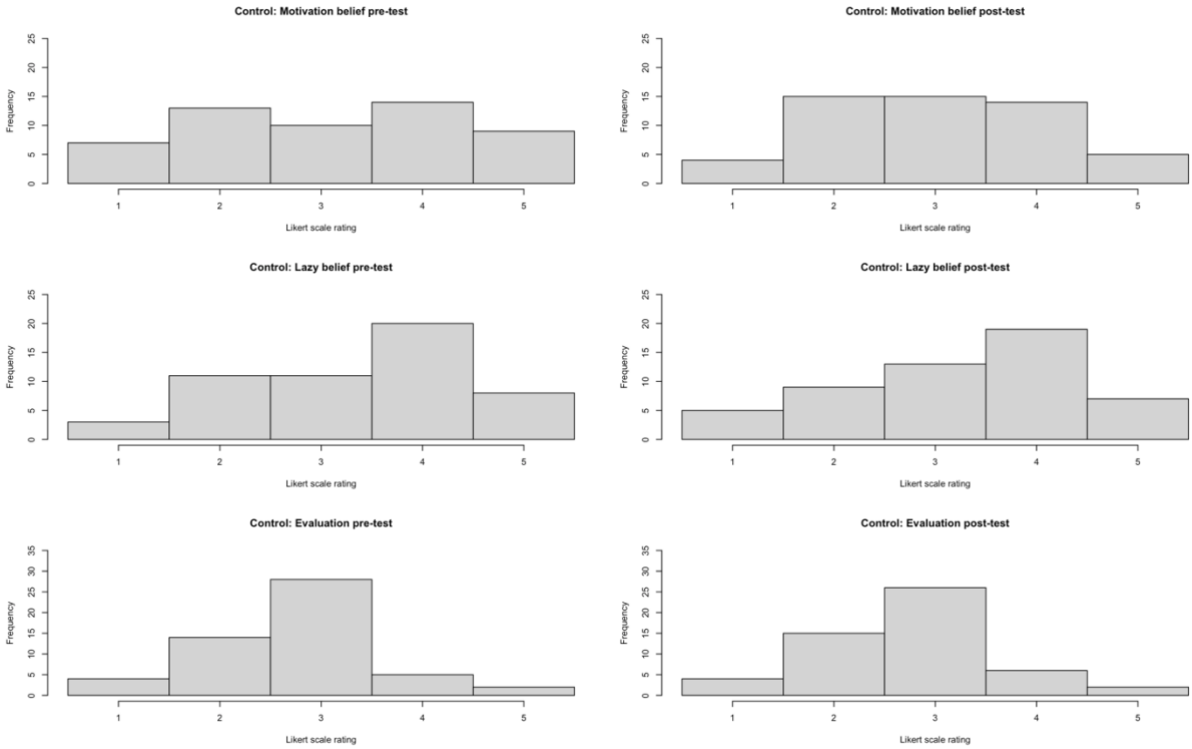


Note. The histograms show us the central tendency, variability, and shape of the data distribution of ratings on a 5-point Likert scale (ranging from 1 to 5; for more details see 'Questionnaires' section) on the three outcome variables in the experimental condition. The absolute frequency is displayed on the y-axis and the Likert scale, ranging from 1 to 5, on the x-axis.

Figure 4 displays six histograms of the pre- and post-test Likert scale ratings on the three outcome variables in the control condition. The first histogram illustrates the pre-test ratings for the first outcome variable, showing a relatively even distribution across the 5-point Likert scale, with higher observations of ratings 2 and 4. The post-test histogram shows a distribution that is more concentrated around the middle range (ratings 2, 3 and 4), with a decrease in the extreme ratings (1 and 5). Furthermore, the histogram of the pre-test ratings on the second outcome variable displays a distribution that is skewed towards the higher end of the scale, with the highest number of observations of the rating 4. The histogram of the post-test ratings shows a similar left-skewed distribution. Finally, the distributions of the pre- and post-test ratings on the third outcome variable seem to be approximately normal with a slight left skew, with higher observations of the rating 3 and less observations of ratings 4 and 5.

Figure 4

Histograms: Pre- and Post-test Likert Scale Ratings on the Outcome Variables in the Control Condition



Note. The histograms show us the central tendency, variability, and shape of the data distribution of ratings on a 5-point Likert scale (ranging from 1 to 5; for more details see 'Questionnaires' section) on the three outcome variables in the control condition. The absolute frequency is displayed on the y-axis and the Likert scale, ranging from 1 to 5, on the x-axis.

Main Analyses

Research Question 1 (RQ1)

For **RQ1**, we conducted two one-tailed paired t-tests to assess whether there was a significant reduction in the two stereotypical beliefs in the experimental group after the intervention (**H1a**). The results of the first paired t-test indicates no significant reduction in the stereotypical belief 'Overweight people are lazy' before (M = 2.80, SD = 1.13) compared to after the intervention (M = 2.75, SD = 1.09), $t(50) = -0.50$, $p = .31$, $d = 0.07$, 95% confidence interval (CI) for this difference = [-∞,0.14]. The Bayes factor analysis produced a Bayes factor of 0.32 (± 0 %), indicating that there is approximately 3 times more evidence for the null hypothesis that there is no significant reduction in the stereotypical belief 'Overweight people are lazy' from the pre- to post-measurement in the experimental group than for the alternative hypothesis. The results of the second paired t-test revealed a statistically significant reduction in the stereotypical belief 'Overweight people lack motivation to exercise' before (M = 2.98, SD = 1.17) compared to after the intervention (M = 2.71, SD = 1.08), $t(50) = -2.71$, $p = .005$, $d = 0.38$, 95% CI for this difference = [-∞,-0.10]. The Bayes factor analysis revealed a Bayes factor of 9.40 (± 0 %), indicating that there is approximately 9 times more evidence for the alternative hypothesis, suggesting that the intervention led to a significant reduction in the stereotypical belief 'Overweight people lack motivation to exercise'.

We conducted additional analyses to determine the achieved power in this sample. The post hoc power analysis revealed a high power of 0.97 (i.e., 97 %) to detect a medium effect size of $d = 0.50$.

We performed two one-tailed between-subjects t-tests to determine if the reduction in both stereotypical beliefs was significantly greater in the experimental group compared to the control group (**H1b**). We calculated the difference scores between the pre- and post-test ratings for both groups. The results of the first Welch Two Sample t-test showed no significantly stronger reduction in the experimental group compared to the control group in the stereotypical belief 'Overweight people are lazy', $t(95.03) = 0.24$, $p = .59$, $d = 0.05$, 95% CI for the difference in means = [-∞,0.28], The Bayes Factor was 0.24 (± 0 %), suggesting that there is approximately 4 times more evidence for the null hypothesis that there is no stronger reduction of the stereotypical belief 'Overweight people are lazy' for the experimental compared to the control group. The results of the second Welch Two Sample t-test revealed no statistically significant difference between the two groups in terms of the reduction in the stereotypical belief 'Overweight people lack motivation to exercise' post-intervention, with $t(102) = -1.37$, $p = .087$, $d = 0.27$, 95% CI for the difference in means = [-∞,0.04]. The Bayes factor analysis revealed a

Bayes factor of 1.07 (± 0.02 %), indicating only slightly more (1.07 times more) evidence for the alternative hypothesis that there is a stronger reduction of stereotypical belief 'Overweight people lack motivation to exercise' after the intervention for the experimental group. The post hoc power analysis revealed a high power of 0.81 (i.e., 81 %) to detect a medium effect size of $d = 0.50$.

Furthermore, we performed an exploratory analysis to investigate the potential effect of the traditional EC-based poster on the two stereotypical beliefs in the control group. We conducted a two-tailed paired t-test checking whether there was a significant change in the stereotypical belief 'Overweight people are lazy' post-intervention. The t-test results indicated no statistically significant difference in the mean scores pre- ($M = 3.36$, $SD = 1.15$) compared to post-intervention ($M = 3.26$, $SD = 1.18$), $t(52) = -1.04$, $p = .30$, $d = 0.14$, 95% CI for this difference in means = [-0.28,0.09]. The Bayes factor analysis revealed a Bayes factor of 0.33 (± 0.02 %), indicating approximately 3 times more evidence for the null hypothesis that there is no significant difference in the belief between pre-test and post-test within the control group. We then performed a separate two-tailed paired t-test testing if there was a significant effect on the stereotypical belief 'Overweight people lack motivation to exercise' post-intervention. The results suggested no significant difference between the pre-test ($M = 3.09$, $SD = 1.32$) and post-test scores ($M = 3.02$, $SD = 1.12$) for this belief in the control group, $t(52) = -0.73$, $p = .47$, $d = 0.50$, 95% CI for this difference in means = [-0.28,0.13]. The Bayes factor was 0.26 (± 0.03 %), indicating approximately 4 times more evidence for the null hypothesis that there is no significant change in the belief post-intervention.

Research Question 2 (RQ2)

For **RQ2**, we conducted a two-tailed paired t-test comparing the evaluation ratings pre- and post-test within the experimental group. The results suggested a statistically significant positive change in evaluations, $t(50) = 3.05$, $p = .004$, $d = 0.43$, 95% CI for the mean difference = [0.08,0.39]. The Bayes factor analysis revealed a Bayes factor of 10.23 (± 0 %), indicating substantial evidence for the alternative hypothesis that the inferential EC-based poster has a significant effect on the evaluations of individuals perceived as obese or overweight.

Furthermore, we performed a two-tailed paired t-test exploring the potential effect of the traditional EC-based poster on the evaluation within the control group. The results indicated no significant effect of the control poster on the evaluation of individuals perceived as obese or overweight, $t(52) = 0.00$, $p > .99$, $d = 0.00$, 95% CI for the mean difference = [-0.19,0.19],

indicating substantial evidence for the null hypothesis (i.e., no difference in mean scores pre- and post-intervention).

Finally, we performed a Welch Two Sample t-test checking if there was a significant difference in mean scores between the experimental and control group. The results revealed no statistically significant difference in the change in evaluation scores between the two groups, with $t(102) = 1.88$, $p = .062$, $d = 0.37$, 95% CI for the difference in means = [-0.01,0.48]. The Bayes factor was 1.20 (± 0.01 %), indicating that the data are almost equally likely under both the null hypothesis (i.e., no difference in mean scores between the groups) and the alternative hypothesis (i.e., a difference exists).

Discussion

Revisiting the Research Problem

Obesity prejudice is a prevalent societal issue (Brewis et al., 2018), particularly in the context of sport (Boudreault et al., 2022; Greenleaf et al., 2012; Thedinga et al., 2021), with individuals facing stigmatization and biased treatment in different life domains (e.g., employment, health care, interpersonal relations) based on their weight. It involves making adverse judgments or having stereotypical beliefs, often associating obesity with traits such as lack of motivation, lower intelligence, laziness, and lack of success (Okumuşoğlu, 2016; Pearl et al., 2017). Despite the recognized need for effective prejudice reduction interventions, current research and literature has notable gaps, including limited studies on obesity prejudice in real-life settings, mixed evidence regarding the effectiveness of existing prejudice interventions, methodological issues (e.g., small sample sizes or a lack of statistical power), and the absence of a well-defined theoretical framework underpinning the existing interventions.

This study aimed to address these gaps by developing and testing a novel inferential EC-based intervention, particularly a poster grounded in the inferential framework. Its effects on two common stereotypical beliefs (e.g., 'Overweight people are lazy' and 'Overweight people lack motivation to exercise') and the evaluation (e.g., as more positive or negative) of individuals perceived as obese or overweight (i.e., target stimulus) was examined in the experimental group. A priori we predicted that there would be a significant reduction in both stereotypical beliefs after the intervention in the experimental group (**H1a**), and that the reduction would be significantly greater in the experimental group compared to the control group, in which a traditional EC-based poster was presented in the gym (**H1b**).

To test these hypotheses, an experimental design was implemented, where participants (i.e., visitors of the gym) were exposed to either the inferential or the traditional EC-based poster that was presented in the gym, and their stereotypical beliefs and evaluations were measured before and after the intervention, using online questionnaires.

Discussion of Research Findings

Research Question 1 (RQ1)

To address our first research question, we hypothesized that there would be a significant reduction in two stereotypical beliefs 'Overweight people are lazy' and 'Overweight people lack motivation to exercise' in the experimental group after the intervention (**H1a**). Our analyses revealed partial support for **H1a**. Specifically, the intervention led to a significant reduction in the belief that 'Overweight people lack motivation to exercise' ($p = .005$, $d = 0.38$). However, it did not significantly reduce the belief that 'Overweight people are lazy' ($p = .31$, $d = 0.07$).

One possible explanation is that the intervention effectively targeted the belief that 'Overweight people lack motivation to exercise' by pairing the target stimulus (i.e., US; individuals who are overweight) with positive, exercise-related stimuli (e.g., CS; 'I love/heart-symbol fitness'). Based on the inferential theory, that suggest that EC effects are more likely to occur when the intervention promotes inferential processes (Van Dessel et al., 2019), this co-occurrence may have led participants to infer that individuals who are overweight are more motivated to exercise, thereby reducing the stereotypical belief about motivation. On the other hand, the stereotypical belief that 'Overweight people are lazy' may not have been directly targeted by the stimuli used in the poster, thus failing to promote inferential processes specific to this belief, as such belief may be more rigidly rooted in broader societal stereotypes that extend beyond exercise and relate to general perceptions of a person's overall work ethic and lifestyle (Puhl & Heuer, 2009; Monaghan et al., 2019; Crocetti et al., 2021), making it a more challenging stereotype to address with a single intervention focused solely on exercise. Additionally, the slogan 'Sporten is onze passie' (which translates to 'Exercising is our passion') provided relational clarity and may have helped participants give extra information about what they should infer from the poster, specifically, that people who are overweight do not necessary lack motivation to exercise rather than that they are not lazy.

The study population for this experiment consisted of gym visitors, a group for whom physical activity and exercise are likely to hold personal and social significance. An alternative explanation for the significant change in the stereotypical belief 'Overweight people lack motivation to exercise', is that the inferential EC-based poster may have evoked more positive emotions and empathy toward individuals who are overweight actively engaging in physical exercise (as this idea may align with the participant's beliefs and values; Lindquist, 2013). Research suggests that emotional processes play a crucial role in prejudiced beliefs and behaviors (Cottrell & Neuberg, 2005; Pakpour et al., 2020; Powell & Consedine, 2021). However, the influence of these emotional responses and effectiveness may vary depending on certain factors,

such as the (social) context and underlying cognitive processes (Aubé & Ric, 2019), and this idea could not explain why we did not find a significant reduction in the stereotypical belief 'Overweight people are lazy'.

Methodological issues may also explain why we did not find a significant effect on the stereotypical belief 'Overweight people are lazy'. For example, due to the naturalistic nature of the study we could not control for other factors or confounders. Also, some participants may have been hasty and not fully engaged with the poster content. Although participants who saw the poster and reported its content in the online questionnaire were included in the study, we cannot be certain that they were aware of the US-CS pairing. Contingency awareness is necessary for constructing propositions, as the acquired knowledge about the stimulus relation is used to evaluate the target stimulus and make inferences (De Houwer, 2018; Hofmann et al., 2010; Moran, Nudler et al., 2022). However, we did find a significant effect on the stereotypical belief 'Overweight people lack motivation to exercise', indicating that the participants may have been aware of the US-CS contingency. Moreover, the intervention's duration and the frequency of exposure to the stimuli may have been insufficient to produce the desired changes in belief.

For our second hypothesis (**H1b**), which predicted that the reduction in the two stereotypical beliefs would be significantly greater in the experimental group compared to the control group after the intervention, we found no substantial evidence for the effect on both beliefs. We calculated the difference scores between the pre- and post-test ratings for both groups and compared them. Positive differences represented an increase in belief or a more positive evaluation after the intervention, negative differences represented a decrease in belief or a more negative evaluation after the intervention, and zero represented no difference in belief or evaluation post-intervention. The results indicated no significantly greater reduction in the beliefs that 'Overweight people are lazy' ($p = .59$, $d = 0.05$) and 'Overweight people lack motivation to exercise' ($p = .087$, $d = 0.27$) in the experimental group compared to the control group. However, the p-value of .087 could be considered marginally significant (i.e., close to the conventional threshold for statistical significance, which is the p-value of 0.05), suggesting that with increased statistical power, a significant effect may be observed.

One possible explanation for these findings is that EC effects in real-life settings, such as a gym, may be less pronounced (Moran, Nudler, et al., 2022), making it difficult to detect a significant effect. Additionally, it's possible that the slogan (to clarify the relation between the pairings) and positive stimuli used in the experimental group did not sufficiently lead to an EC effect or did not effectively promote the intended inferential processes compared to the control

group. Additionally, individuals in the experimental group may have resisted changing their prior beliefs where they selectively accepted information that confirms their existing views and rejected information that contradicts them, because they felt threatened due to the extra information given in the inferential EC-based poster (Cottrell & Neuberg, 2005; Pakpour et al., 2020; Aubé & Ric, 2019; Powell & Consedine, 2021).

The gym environment where the study was conducted could have also contributed to the limited effectiveness of the intervention. In environments where societal norms about body image are strongly reinforced (Pallotto et al., 2022; Voelker et al., 2022), interventions may need to be more intensive or supplemented with other approaches to counteract prevailing attitudes and stereotypical beliefs. Moreover, differences in engagement levels or how the message was received as well external factor such as societal attitudes, media portrayals, or personal experiences or knowledge may also explain the persistence of stereotypes and counteract the effects of the intervention (Marks et al., 2020; Monaghan et al., 2019; Puhl & Heuer, 2009; Crocetti et al., 2021; Selensky & Carels, 2021).

Another possible explanation could be the differences in the samples between the conditions. Different age groups (experimental condition: M = 26.80, SD = 7.76; control condition: M = 26.08, SD = 7.26) may have varying levels of stereotypical beliefs or respond differently to interventions. For instance, younger participants might be more or less susceptible to change compared to older participants. Variances in gender distribution could also affect the results. For example, the experiment group had a higher proportion of the male gender (i.e., 69 % males and 31 % females) compared to the control group (i.e., 66 % males and 34 % females), and if that gender generally holds different stereotypical beliefs or responds differently to the intervention, this could skew the results. Moreover, a difference in sample sizes may influence the statistical power and lead to a variability in results, although the current sample sizes were relatively close (51 in the experimental group and 53 in the control group). However, we did not test the effects of these potential moderators, therefore we cannot make conclusions based on our findings.

The baseline levels of the stereotypical beliefs differed between the groups. Specifically, the control group showed higher pre-intervention mean scores (M = 3.09 and SD = 1.32 for the belief ‘Overweight people are lazy’; M = 3.36 and SD = 1.15 for the belief ‘Overweight people lack motivation to exercise’) compared to the experimental group (M = 2.98 and SD = 1.17 for the belief ‘Overweight people are lazy’; M = 2.80 and SD = 1.13 for the belief ‘Overweight people lack motivation to exercise’; see Table 1 on p. 19). These baseline differences may have

made it more challenging to detect significant changes in stereotypical beliefs within the experimental group.

Overall, we cannot provide a conclusive answer to **RQ1**: '*Does the inferential EC-based poster have an effect on the stereotypical beliefs about individuals perceived as obese or overweight?*', since we found partial support for **H1a** and no support for **H1b**.

The exploratory analysis conducted to assess the potential impact of the traditional EC-based poster (used in the control condition) on the two stereotypical beliefs 'Overweight people are lazy' and 'Overweight people lack motivation to exercise' revealed no significant changes in these beliefs post-intervention. It is important to note that this analysis was exploratory in nature, and no prior hypotheses were established regarding the expected outcomes. Future studies should replicate the study and examen the effects of a traditional EC-based poster on the stereotypical beliefs.

One possible explanation for these findings relates to the variability in participants' perceptions of the poster stimuli. Participants were included if they could recall seeing the poster and describe its content. Some participants reported seeing only the images of individuals who are overweight (i.e., *US*) and not the positive stimuli (i.e., *CS*). This suggests that there may have been a lack of high contingency awareness of the US-CS pairing, which is important for the formation of propositions and the occurrence of EC effects (Hofmann et al., 2010; De Houwer, 2018; Moran, Nudler et al., 2022). While others interpreted the poster and mentioned concepts (such as 'sexuality') not related to the poster, which could be a potential confounder. Moreover, it is important to note that some participants were in a hurry, which may have affected the quality of their responses. Naturalistic settings introduce variability in participant behavior that can impact the effectiveness of interventions (Moran, Nudler, et al., 2022).

Furthermore, the results potentially align with some key conclusions from the studies conducted by Lai et al. (2014) and Calanchini et al. (2020), suggesting that while EC interventions may influence implicit attitudes or preferences, their impact on explicit beliefs and behaviors can be limited and inconsistent. However, most studies that showed significant EC effects were primarily conducted in controlled, non-real-life settings (Moran, Nudler, et al. (2022).

Research Question 2 (RQ2)

To address our second research question, we did not have a priori hypotheses regarding the outcome variables, therefore, the results should be carefully interpreted and a replication study has to be conducted in order to confirm these results. We conducted exploratory analyses checking if the inferential EC-based poster (i.e., presented in the experimental condition) and the traditional EC-based poster (i.e., presented in the control condition) had an effect on the evaluation of the target stimulus (i.e., individuals who are overweight), as well as if there was a difference in the effect between the experimental and control condition.

The results suggested that there might have been a significant effect of the inferential EC-based poster on the evaluation of individuals who are overweight ($p = .004$, $d = 0.43$). The mean difference (0.24) indicated a potentially positive change in evaluations. Under the inferential framework, the observed positive change in evaluations could be potentially understood as a result of the inferential processes promoted by the poster (Hofmann et al., 2010; Van Dessel et al., 2019; Bartolo & Averbeck, 2021; Moran, Nudler, et al., 2022; Van Dessel et al., 2022). The EC effects may have occurred through the conscious formation of propositions about the US (i.e., *unconditioned stimulus*)-CS (i.e., *conditioned stimulus*) relationship, as participants used this knowledge to make positive inferences and subsequently evaluated the target stimulus as more positive. Additionally, the pairing of individuals who are overweight (i.e., US) with positive exercise-related stimuli (i.e., CS) and the slogan 'Exercising is our passion' (which provided relational clarity) may have been congruent with participants' own beliefs about the importance of physical activity. Because of this congruency, they were potentially more likely to evaluate individuals who are overweight more positive, resulting in the EC effect. However, this interpretation remains speculative.

Furthermore, we explored the effect of the traditional EC-based poster on the evaluation of the target stimulus and potentially found no significant effect ($p > .99$, $d = 0.00$). These results may contrast with EC theory, which posits that EC effects (i.e., changes in preference or evaluation) could occur when a US is repeatedly paired with a valenced CS (De Houwer, 2007; Moran, Nudler, et al., 2022). However, since the study was conducted in a naturalistic setting, the traditional EC-based poster may not have been sufficient to reliably establish EC effects, as it did not promote inferential processes. This might help explain why significant effects were observed with the inferential EC-based poster in the experimental group, as it provided additional information to clarify the relationship between the pairings (e.g., through the slogan 'Exercising is our passion') and used exercise-related stimuli as CSs (Van Dessel et al., 2019; Van Dessel et al., 2022).

Finally, the exploratory analysis on the difference in effect on the evaluation of the target stimulus between the experimental and control condition potentially revealed no statistically significant difference between both conditions ($p = 0.062$, $d = 0.37$). According to De Houwer (2007), EC effects could be detected if the only difference between the experimental and control condition is the EC procedure, more specific, the way of pairing the stimuli. Since the study was conducted in a naturalistic setting, with participants recruited on the spot upon entering the gym, we had limited control over potential confounding factors and external variables. For example, we could not account for differences in participants' levels of engagement with the posters or variations in demographic characteristics, which means we could not ensure that the groups were equivalent for comparison purposes. Additionally, the Bayes factor was 1.20 (which is close to a Bayes factor of 1), suggesting that the data was almost equally under both the null hypothesis (i.e., no difference in mean scores between the conditions) and the alternative hypothesis (i.e., a difference exists), implying that the results of this explorative analysis may be inconclusive. Factors such as the sample size, a lack of statistical power, or experimental manipulation could possibly explain why the results may be inconclusive. Moreover, we created two questionnaires for this study that were not tested for reliability and validity. We measured the outcome variables using a 5-point Likert scale (ranging from 1, being 'Completely negative', to 5, being 'Completely positive'), which could have been not sensitive enough to detect subtle changes in pre- and post-intervention scores.

Overall, this study cannot formulate a conclusive answer on **RQ2**: '*Does the inferential EC-based poster have an effect on the evaluation of individuals perceived as obese or overweight?'*, since the analyses conducted were exploratory in nature and a replication study has to be conducted in order to examine the effects. However, we did find a potentially significant positive effect on the evaluation of the target stimulus ($p = .004$), though the effect size was small to moderate ($d = 0.43$).

Theoretical and Practical Implications

Despite not finding consistent evidence for the effects of the inferential EC-based poster on stereotypical beliefs, our current findings may be theoretically and practically relevant.

In terms of theoretical implications, our findings suggest that using interventions based on the inferential framework and the EC theory may be effective in reducing stereotypical beliefs of individuals perceived as obese or overweight (similar to the conclusions of other research: Van Dessel et al., 2019; Bartolo & Averbeck, 2021; Moran, Nudler, et al., 2022; Van Dessel et al., 2022). While this study provided no evidence for a significant reduction across multiple stereotypical beliefs, we observed a significant reduction in one specific stereotype (i.e., 'Overweight people lack motivation to exercise'), suggesting that we may observe EC effects when promoting inferential processes in the intervention (e.g., by incorporating counter-attitudinal cues or positive stimuli in the poster) and adding information in order to clarify the relationship between the pairings. Moreover, it is important to use specific, positive stimuli in the UC-CS pairings when targeting certain types of (stereotypical) beliefs.

Furthermore, the study found no substantial evidence for the notion that the inferential EC-based poster may be more effective in reducing stereotypical beliefs compared to a traditional EC-based poster. However, when exploring the effects of the traditional EC-based poster (for which we did not have a priori hypotheses), we found no significant changes in both stereotypical beliefs (i.e., 'Overweight people are lazy' and 'Overweight people lack motivation to exercise'), potentially suggesting that extra information and inferential cues are necessary in real-life context when trying to reduce prejudiced beliefs or behavior.

Additionally, our findings from the exploratory analysis suggest that interventions grounded in inferential EC may also potentially lead to significant changes in the evaluations of individuals perceived as obese or overweight.

Overall, this study adds to the expanding literature EC interventions, specifically within the context of obesity prejudice, an area with relatively limited research, especially outside of controlled experimental settings (Moran, Nudler, et al., 2022).

In terms of practical implications, our findings demonstrated the feasibility and success of integrating inferential EC into daily life (Conroy & Kim, 2021). While many existing prejudice reduction interventions, such as direct contact with outgroups or persuasive techniques (Paluck et al., 2021), have shown mixed results in effectiveness and can be resource-intensive (e.g., requiring significant financial investments or time commitments), their practicality for

widespread implementation remains limited. This current study opted to create a non-invasive intervention, grounded in scientific research, that is easily modified to surrounding circumstances and contexts. Elements such as the layout, presentation of US-CS pairings, and the medium of delivery can be easily modified to fit different environments and the study population.

Additionally, it is essential to recognize that interventions targeting specific stereotypical beliefs should not adopt a ‘one size fits all’ approach. Instead, relevant inferential cues that address the targeted belief must be incorporated, accompanied by additional information to clarify what inferences viewers should infer from the intervention.

Limitations

The present study was subject to several methodological limitations, common within research conducted in naturalistic settings (for example, see Conroy & Kim, 2021). One potential issue was the use of self-created online questionnaires, employing a 5-point Likert scale to measure the outcome variables (i.e., the two stereotypical beliefs and the evaluation), for which we did not assess the validity or reliability. Without validity testing, it remains uncertain whether the questions accurately measured the intended constructs, and without reliability testing, there is no assurance that the results would be consistent across repeated administrations. Furthermore, the use of a 5-point Likert scale may have limited the sensitivity of the measurement, potentially not detecting smaller changes in stereotypical beliefs or evaluations. As this study developed novel questionnaires, similar research was unavailable, and there was no existing validated or reliable measurement tool that could be used in our study to measure the outcome variables.

The posters were displayed throughout the entire day rather than in specific time intervals, which was the original plan (e.g., displaying the inferential EC-based poster in the afternoon and the traditional EC-based poster in the evening, potentially reducing the time required to conduct the study). Working with time intervals was not feasible because participants typically spent one to two hours at the gym. If the posters were switched during that time, participants might have been exposed to both posters, which could have confounded the results. This current approach may have made the study more resource-intensive, such as one researcher conducted the entire experiment in a private gym over four separate days, from 3.30 p.m. to 10 p.m. While feasible in a private gym with potentially fewer visitors during those hours, this approach may have been more challenging in a crowded public gym, where a higher volume of visitors could disrupt the recruitment of the participants.

We used an incentive (e.g., a chance to win a €10,00 Bol.com gift voucher) as a motivator for participants to complete the entire study. This could have affected the findings, by potentially introducing response bias. Participants may be more focused on completing the study quickly or superficially to obtain the reward, rather than thoughtfully engaging with the intervention. This could lead to less reliable data, as their responses might not accurately reflect their true attitudes or beliefs. However, the online questionnaire included an item checking for this response bias and reactant participants were excluded (1 reactant participant was excluded; 0.76 %).

The lack of experimental control and a rigorous study design may have limited the effectiveness of the intervention. The study was conducted in a gym, a naturalistic setting subject to a variety of uncontrollable variables that could have influenced the outcomes, such as distractions, time constraints, prior knowledge or personal experiences with prejudice,

conversations with other participants, and external factors affecting participants' engagement with the intervention, which may have led to inconsistent exposure to the intervention across participants. Furthermore, participants were included if they indicated seeing the poster, as well as reporting its content. Some only reported seeing the images of individuals who are overweight (i.e., US), without mentioning the positive stimuli (i.e., CS). This could potentially indicate a lack of contingency awareness, which could affect the effectiveness of the poster (Hofmann et al, 2010). Therefore, the findings should be interpreted cautiously within these constraints, and causal statements should be avoided.

There was only one poster per condition presented in the gym facility, which could lead to limited exposure to the intervention, resulting in no significant changes in stereotypical beliefs or the evaluation of individuals perceived as overweight. Additionally, we did not examine the long-term effects of the poster on the outcome variables. Most interventions in real-life setting vanish quickly, suggesting that the poster-intervention might need further reinforcement by adding other methods targeting prejuce for lasting effects (Alsalihi, 2020; Hasanica et al., 2020; Ilić & Rowe, 2013; Oronje et al., 2022)

Furthermore, we did not investigate the effects of age, gender, or the day of the intervention, as these were not the primary focus of the study. However, these factors could be potential moderators. For instance, the time of day may influence participants' mood, responses, or engagement with the poster, potentially leading to variations in its effectiveness.

The samples of the experimental group and the control group were not identical, such as differences in age groups, gender proportion, sample size and pre-test scores. These disparities may influence the statistical power and introduce variability in the data that may confound the effects of the intervention, making direct comparisons between the groups less valid. Any observed effect on the outcomes might be attributed to these pre-existing characteristics (e.g., age or gender) rather than the intervention itself, thereby reducing the ability to draw accurate conclusions about the intervention's effectiveness. Moreover, the participants where visitors of a private gym, which may not represent the diverse population seen in other (public) gyms, or sports environments, limiting generalizations of the findings.

Another important limitation of this study, was that we did not conduct a pilot study prior to the experiment, testing what types of inferences participants make when looking at the poster. As a result, the poster may not have been optimally designed to target the relevant stereotypical beliefs ‘Overweight people are lazy’ and ‘Overweight people lack motivation to exercise’. The inconsistency in the effects of the inferential EC-based poster on these beliefs could be attributed to the choice of conditioned stimuli (e.g., t-shirts displaying ‘I love/heart-symbol fitness’) and

the slogan (i.e., 'Exercising is our passion'), as they may have targeted only the stereotypical belief about motivation to exercise. The purpose of the slogan was to clarify the UC-CS relationship and guide participants on what they should infer from the poster. However, the addition of this extra information could be perceived as a form of persuasion rather than a pure EC intervention, raising the possibility that any observed effects may be attributed to the slogan rather than the UC-CS pairing. Nonetheless, the study still examined the effects of the pairing while providing additional information to clarify the intended relationship, and as such, it can still be classified as an EC intervention.

Finally, the poster may not have promoted sufficient engagement or interaction with the content. Attitudes can be influenced by inferential processes arising from actions that align with these specific attitudes or beliefs (Van Dessel et al., 2019). If the poster did not encourage active engagement or 'meaningful' interaction (i.e., promoting inferences relevant to counteract the stereotypical belief), its capacity to alter deeply held stereotypes may have been limited.

Benefits

Despite the limitations, this study has several strengths and contributions to the field of prejudice reduction, specifically regarding obesity prejudice in gym environments. Current literature shows inconsistent evidence regarding the effectiveness of current EC interventions as well as limited research outside controlled, lab-based settings (Moran, Nudler, et al., 2022). By focusing on an inferential EC-based intervention, the research breaks new ground in applying a novel theoretical framework to real-world settings. Implementing an inferential EC-based poster in the gym setting may have immediate, positive impact on prejudiced beliefs within this context, where individuals who are overweight frequently face discrimination (Boudreault et al., 2022; Greenleaf et al., 2012; Thedinga et al., 2021). This study could potentially promote greater inclusivity and body positivity, reduce stigma, and contribute to fostering a more accepting and supportive environment.

Naturalistic research can provide a more accurate and comprehensive understanding of obesity prejudice. The findings are more likely to reflect real-world conditions, as they are gathered in the natural context, specifically the gym, where the phenomena typically occur. Participants are more likely to exhibit natural behavior when they are in a familiar setting, as opposed to a controlled laboratory environment where they might alter their behavior due to awareness of observation or artificial conditions. This may enhance ecological validity, which can be valuable for refining the inferential EC intervention.

Finally, the combination of a substantial sample size (i.e., a total of 104 participants with 51 participants in the experimental group and 53 participants in the control group), high statistical power with values of 97% and 81% for the different analyses conducted, and the presence of a control group contributes to the robustness and validity of our findings. The high power indicates a strong likelihood that our study could detect significant effects, reducing the risk of Type II errors and reinforcing the credibility of our results.

Considerations Future Research

While this study presents valuable insights, there are limitations that should guide future research. One of the primary considerations is the relatively short-term nature of the intervention's effects. Future studies should explore the long-term effects of the inferential EC-based poster by conducting long-term follow-up assessments to determine whether the reduction in stereotypical beliefs persists over time or whether repeated exposure to the intervention (e.g., by displaying more posters in the gym) is necessary to sustain the effects.

Another area for improvement is the generalizability of the findings. Although the study was conducted in a gym setting and the sample size was large, future research could replicate this study to different contexts, such as workplaces, schools, and public health campaign, to evaluate the adaptability and effectiveness of inferential EC interventions in varied environments. Moreover, the effectiveness of the intervention could be tested on other stereotypical beliefs or prejudiced behavior. This would also help to understand under which circumstances such interventions work best and provide further evidence on how to optimize their effectiveness.

Future research could consider the diversity of the participants, including their pre-existing beliefs towards individuals who are overweight. For instance, future studies could examine how this intervention might be adapted for individuals with stronger, more ingrained prejudices compared to those with more moderate biases. Additionally, researchers should examine potential moderators such as age, gender, and the timing of the intervention. These factors could influence participants' responses and engagement, providing a more nuanced understanding of the intervention's effectiveness. They could statistically control for these factors by using, for example, ANOVA (i.e., Analysis of Covariance) assessing whether the intervention’s effects are significant after accounting for these effects.

Ensuring that experimental and control groups are comparable in terms of demographics and pre-test scores is essential for valid comparisons. Future research should aim for balanced sample characteristics to minimize confounding variables and improve the reliability of comparisons between groups

Refining the methodology, such as by incorporating measures of implicit bias and mixed-method approaches, could lead to a deeper understanding. Future researchers could also examine whether combining EC-based interventions with other strategies, such as direct-contact interventions or cognitive training, might produce even stronger effects in combating obesity prejudice.

In addition to integrating this intervention with other effective approaches, researchers should first conduct a pilot study with a representative sample, which can be efficiently carried out online. This preliminary study will help evaluate the reliability and sensitivity of the measures used in the main experiment and aid in designing an effective inferential EC-based poster. The pilot study can identify the most suitable stimuli for targeting the intended stereotypical belief and provide valuable insights into what inferences people make when looking at the poster.

Finally, it is important to replicate this study in a similar setting in order to confirm the findings and explore the results found in the exploratory analyses. We potentially found an effect of the inferential EC-based poster on the evaluation of the target stimulus; however, we cannot make conclusions based on these analyses. In order to establish causal relationships as well as enhance the predictive power of the findings, more rigorous research is needed such as randomized controlled trials, quasi-experimental or longitudinal designs.

Conclusion

The study's findings suggest that inferential evaluative conditioning (EC) interventions can potentially reduce stereotypical beliefs about individuals perceived as obese or overweight in sports environments. The intervention involved a poster based on the inferential framework, a newly emerging theory that suggests adding inferential or goal-related cues that promote inferential processes can enhance EC effects. This study specifically examined the effectiveness of the poster in reducing two common stereotypical beliefs: 'Overweight people are lazy' and 'Overweight people lack motivation to exercise' (**RQ1**), while also assessing its impact on the evaluation of individuals perceived as obese or overweight (**RQ2**). The intervention was implemented in a gym setting, with a comparison made to a traditional EC-based poster, which was used in the control condition.

The results were mixed. Although the intervention did not consistently reduce all targeted stereotypical beliefs or consistently outperform the traditional EC-based poster, it did significantly reduce the belief that overweight people lack motivation to exercise, with a small to moderate effect size. Additionally, the study potentially found positive effects of the poster on the evaluation of individuals perceived as overweight, as these individuals were evaluated more positively after the intervention. However, this effect requires further investigation. These findings suggest that inferential EC interventions can have a positive impact on specific stereotypical beliefs, though their effectiveness may vary.

The study underscores the potential of inferential EC-based posters as non-invasive interventions to reduce obesity-related prejudice, but also highlights the complexities of applying such interventions in real-world settings like gyms. In terms of broader implications, the study highlights the need for more research on EC interventions in real-life settings to better understand their effectiveness. Future research should aim to replicate the findings and explore variations in intervention designs to improve effectiveness.

Overall, this study provides valuable insights into the potential of inferential EC interventions in everyday environments and lays a foundation for future research to explore the conditions under which such interventions are most effective.

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Appendices

Appendix 1: Information and informed consent form participants (in Dutch)

Information form

INFORMATIEBRIEF DEELNEMERS ONDERZOEK

Titel van de studie: Onderzoek naar de overtuigingen van bezoekers aan de gym

Dit is een **studie van de Universiteit Gent**. De verantwoordelijke onderzoekers zijn Kristien Bondarenko (hoofdonderzoeker), Zhefei Mao (begeleider), en Prof. Dr. Pieter Van Dessel (hoofdbegeleider).

Neem voldoende tijd om deze informatiebrief aandachtig te lezen voor u beslist deel te nemen aan deze studie. Aarzel niet om vragen te stellen aan de onderzoeker als er onduidelijkheden zijn of indien u bijkomende informatie wenst. Eens u beslist heeft om deel te nemen aan de studie kan u deze pagina sluiten en toestemmingsformulier ondertekenen.

A. Informatie over de studie

Het doel van dit onderzoek is om een beter begrip te krijgen van de overtuigingen en het gedrag van bezoekers aan de gym. Meer informatie over het onderzoeksopzet kan u terugvinden bij punt B.

Ethiek

De studie wordt uitgevoerd volgens de richtlijnen uit het Algemeen Ethisch Protocol van de Faculteit Psychologie en Pedagogische Wetenschappen (Universiteit Gent). De onderzoekers voeren dit onderzoek uit in overeenstemming met de geaccepteerde maatstaven voor wetenschappelijk en ethisch gedrag. Hierbij hanteren ze goede onderzoekspraktijken en houden zij zich aan de principes van onderzoeksethiek zoals beschreven in "Ethics in Social Science and Humanities" (EU, 2018)

B. Informatie m.b.t. deelname

Deze studie bestaat uit het **invullen van twee vragenlijsten** (één aan het begin en één aan het einde van uw gymbezoek) en het bekijken van een poster. Het invullen van de vragenlijsten gebeurt digitaal en neemt ongeveer **één tot twee minuten** in beslag. Het verloop van de studie:

- U wordt gevraagd om de eerste vragenlijst aan het begin van uw gymbezoek in te vullen.
- Na het invullen van de eerste vragenlijst kan u uw fitnessactiviteiten uitvoeren. Er wordt u gevraagd om een poster die opgehangen is bij de uitgang van het fitnesscentrum kort te bekijken. Het moment waarop u de poster bekijkt kan u zelf kiezen, zolang dit gebeurt voordat u het fitnesscentrum verlaat.
- Na uw gymbezoek zullen we u vragen om een tweede vragenlijst in te vullen. Hierbij maakt u kans om een bon van Bol.com (t.w.v. 10 euro) te winnen. Om te bepalen of je gewonen hebt, trek je na je deelname een kaartje uit een bokaal.

In de eerste vragenlijst verzamelen we demografische gegevens over uw leeftijd en gender om de steekproef te beschrijven. De deelname aan deze studie is volledig vrijwillig en er kan op geen enkele manier sprake zijn van dwang. U kunt weigeren om deel te nemen aan de studie en u kunt zich op elk ogenblik terugtrekken uit de studie zonder dat u hiervoor een reden moet opgeven. Indien u weigert om deel te nemen, of wanneer u beslist zich terug te trekken uit een lopende studie, zal dit op geen enkele manier een negatieve invloed hebben op u.

Als u dit wenst, kan u een samenvatting van de onderzoeksbevindingen krijgen nadat de studie afgerond is en de resultaten bekend zijn. Om een samenvatting te krijgen, kunt u dit aanvragen bij de onderzoeker waarmee u contact hebt.

Wat zijn de risico's en voordelen bij deelname aan dit onderzoek?

Aan dit onderzoek is geen enkel gekend risico verbonden. Er worden geen voordelen verwacht bij deelname aan dit onderzoek met uitzondering van de (maatschappelijke) voordelen die voortkomen uit het ondersteunen van wetenschappelijk onderzoek.

C. Informatie m.b.t. Privacy en Persoonsgegevens

Het wettelijk kader voor de verwerking van persoonsgegevens en vertrouwelijke informatie in het kader van dit onderzoek wordt bepaald door: De Europese Algemene Verordening Gegevensbescherming 2016/679 van 27 april 2016, die van kracht is sinds 25 mei 2018 (dit is de AVG of GDPR); De Belgische Wet betreffende de bescherming van natuurlijke personen met betrekking tot de verwerking van persoonsgegevens van 30 juli 2018. De onderzoekers dienen zich te houden aan de generieke gedragscode voor de verwerking van persoonsgegevens van de UGent.

Welke persoonsgegevens worden verzameld?

De volgende persoonsgegevens zullen worden verwerkt:

- Gender en leeftijd.
- Antwoorden op de twee vragenlijsten met betrekking tot overtuigingen

Waarom worden deze persoonsgegevens verzameld?

Uw leeftijd en gender zullen gebruikt worden voor de beschrijving van de mensen die deelnemen aan de studie. Uw antwoorden op de vragenlijsten zullen worden gebruikt om onderzoeksvragen te beantwoorden.

Op basis van welke rechtsgrond worden de gegevens verwerkt?

Voor het verwerken van uw persoonsgegevens zal uw expliciete toestemming gevraagd worden. Dit gebeurt via het aangeven van toestemming via een online informed consent formulier. Deze toestemming kan ten alle tijden worden ingetrokken door dit te melden aan een hoofdonderzoeker.

Wie heeft toegang tot mijn (persoons)gegevens?

Gegevens die mogelijk kunnen leiden tot identificatie (gender en leeftijd) worden verzameld los van de antwoorden op de vragenlijsten. Enkel de onderzoekres zullen hiertoe de toegang hebben en deze zullen onmiddellijk verwijderd worden zodra de analyses uitgevoerd zijn. Alle andere gegevens zullen bewaard worden na het afronden van de studie.

Deze niet-identficeerdbare gegevens kunnen ook nog nuttig zijn bij het beantwoorden van andere onderzoeksvragen. Daarom bestaat de mogelijkheid dat deze anonieme onderzoeksgegevens worden hergebruikt op een later tijdstip voor ander onderzoek. De anonieme gegevens kunnen gedeeld worden met andere onderzoekers of op een online openbaar platform zoals het Open Science Framework (OSF, https://osf.io/). OSF is wereldwijd toegankelijk. Hiervoor zult u expliciete toestemming geven in het toestemmingsformulier. De gegevens die gedeeld worden, zullen anoniem zijn, wat wil zeggen dat niemand uw identiteit kan achterhalen op basis van de gedeelde gegevens zoals wordt voorgeschreven in de UGent Generieke Gedragscode voor het omgaan met persoonsgegevens en vertrouwelijke informatie.

Welke rechten heeft u als deelnemer met betrekking tot uw persoonsgegevens?

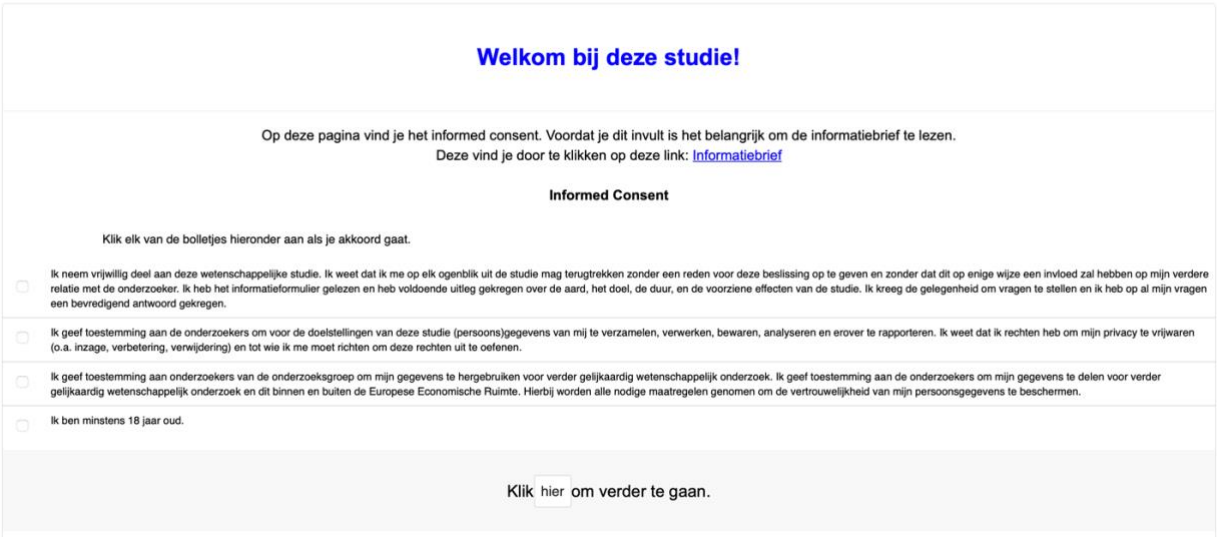
In overeenstemming met de Europese en Belgische privacywetgeving wordt uw persoonlijke levenssfeer gerespecteerd. Zoals reeds aangegeven, kan u op elk gegeven moment uw toestemming intrekken en dit zonder opgave van reden. Dit betekent dat uw persoonsgegevens niet verder verwerkt zullen worden vanaf het moment van intrekking. U heeft tevens het recht op inzage van de persoonsgegevens die over u verzameld werden en u kan eveneens een kopie vragen, voor zover dit geen afbreuk doet aan de rechten en vrijheden van anderen, waaronder die van de Universiteit Gent. Elk onjuist gegeven over u kan op uw verzoek verbeterd worden. Bovendien heeft u recht op vergetelheid: dit betekent dat u, na het intrekken van uw toestemming, kan vragen om uw persoonsgegevens te laten verwijderen. Om een van bovenstaande rechten uit te oefenen, kan u contact opnemen met de betrokken onderzoekers via kristien.bondarenko@ugent.be.
Uw gegevens met betrekking tot de vragenlijsten worden volledig geanonimiseerd, wat wil zeggen dat uw gegevens niet meer aan u gelinkt kunnen worden na afloop van het experiment. Gegevens die reeds anoniem verzameld werden, kunnen dus niet meer geïdentificeerd, verbeterd of verwijderd worden.

Heeft u een klacht?

Als u een klacht wil indienen over de manier waarop uw persoonsgegevens worden behandeld of als u vragen heeft met betrekking tot uw persoonsgegevens in het kader van dit onderzoek, dan kan u contact opnemen met de functionaris voor gegevensbescherming van de Universiteit Gent via privacy@ugent.be of T 09 264 95 17.
U kan ook een klacht indienen bij de Gegevensbeschermingsautoriteit, Drukpersstraat 35, 1000 Brussels (e-mail: contact@apd-gba.be) en/of the Vlaamse Toezichtcommissie (e-mail: contact@toezichtscommissie.be).

Sluit deze pagina als je deze informatie gelezen hebt en vul het toestemmingsformulier in wanneer u wenst deel te nemen aan de studie.

Informed consent form



Welkom bij deze studie!

Op deze pagina vind je het informed consent. Voordat je dit invult is het belangrijk om de informatiebrief te lezen.
Deze vind je door te klikken op deze link: Informatiebrief

Informed Consent

Klik elk van de bolletjes hieronder aan als je akkoord gaat.

- Ik neem vrijwillig deel aan deze wetenschappelijke studie. Ik weet dat ik me op elk ogenblik uit de studie mag terugtrekken zonder een reden voor deze beslissing op te geven en zonder dat dit op enige wijze een invloed zal hebben op mijn verdere relatie met de onderzoeker. Ik heb het informatieformulier gelezen en heb voldoende uitleg gekregen over de aard, het doel, de duur, en de voorziene effecten van de studie. Ik kreeg de gelegenheid om vragen te stellen en ik heb op al mijn vragen een bevredigend antwoord gekregen.
- Ik geef toestemming aan de onderzoekers om voor de doelstellingen van deze studie (persoons)gegevens van mij te verzamelen, verwerken, bewaren, analyseren en erover te rapporteren. Ik weet dat ik rechten heb om mijn privacy te vrijwaren (o.a. inzage, verbetering, verwijdering) en tot wie ik me moet richten om deze rechten uit te oefenen.
- Ik geef toestemming aan onderzoekers van de onderzoeksgroep om mijn gegevens te hergebruiken voor verder gelijkaardig wetenschappelijk onderzoek. Ik geef toestemming aan de onderzoekers om mijn gegevens te delen voor verder gelijkaardig wetenschappelijk onderzoek en dit binnen en buiten de Europese Economische Ruimte. Hierbij worden alle nodige maatregelen genomen om de vertrouwelijkheid van mijn persoonsgegevens te beschermen.
- Ik ben minstens 18 jaar oud.

Klik hier om verder te gaan.

Appendix 2: Online Data Management Plan

Applying evaluative conditioning to combat obesity prejudice in gym environments

A Data Management Plan created using DMPonline.be

Creator: Kristien Bondarenko

Affiliation: Ghent University (UGent - UZ Gent)

Template: Generic DMP +

ID: 206505

Start date: 22-09-2023

End date: 16-08-2024

Project abstract:

Master's Thesis: investigating the effects of an evaluative conditioning-based intervention (i.e., a poster grounded in the inferential framework) on prejudiced beliefs and evaluations of individuals perceived as obese or overweight. This research will be carried out within the context of a sports environment, specifically in gyms, where obesity prejudice is likely prevalent.

Last modified: 01-07-2024

Applying evaluative conditioning to combat obesity prejudice in gym environments
Generic DMP +

Administrative Data

Date of first version

07/05/2024

Date of last update

01/06/2024

Data Collection

What data will you collect or create?

Primary personal data such as responses to two questionnaires (e.g., statements regarding stereotypical beliefs, evaluative questions) and demographic information (e.g., age and gender), which are collected digitally via lab.js. We won't be reusing existing or third-party datasets.

Formats: CSV files. We will be using open formats so that they can be accessible for other users.

Volume: not applicable.

How will the data be collected or created?

Data will be collected via lab.js (see https://lab.js.org). Participants will be recruited on the spot, when entering the gym.

The study setup: visitors of the gym will be asked (by a researcher) to participate in a study, conducted by UGent. If they agree, they will receive a QR-code from the researcher with a link to the information and informed consent form and the first questionnaire. Additionally, the participants receive an unique participation code from the list and the researcher writes down the names and the type of condition next to the corresponding code (purpose: to match data from the pre- and post-measurement; these names will not be used in any other way and will be crossed off the list at the end of the study). They scan de QR-code with their smartphone if possible (alternatively, the researcher's smartphone) and complete the two digital forms and the first questionnaire. Then, they will receive online instruction to go and view the poster (either the control or inferential EC-based poster). Upon leaving the gym, participants will be verbally reminded to complete the second questionnaire. They then receive a QR code from the researcher. Additionally, the researcher will remind them of their unique participation code and cross their name off the list.

We will use repeated measurements: collect data from the same participants at multiple points in time (pre- and post-measurement), use the same items in both questionnaires.

Before starting the study, the gym will receive an information and informed consent form, regarding the permission to use the gym as our study environment, approach visitors of the gym and hang the poster.

For the measurement processes a 5-point Likert scale will be used, which allows participants to indicate their level of agreement. Additionally, there will be open-ended questions (regarding the awareness of the intervention) and closed questions, that require selecting from predetermined options (e.g., yes-no, selecting one's age or gender).

The research questions and hypotheses, study design and procedure will be pre-registered on the Open Science Framework (OSF, see https://osf.io/).

Strategy for version control: not applicable.

Data Documentation and Metadata

How will you document the data?

All data will be stored in two seperate and private folders, named '2023-2024_MasterThesis' in UGent OneDrive network (in Microsoft 365), and in 'Project: EC to combat prejudice in real-life' on Open Science Framework (see https://osf.io/). Access to the UGent OneDrive network is restricted to authorized individuals only (e.g., people with an UGent email adress: the head researcher, the supervisor and co-supervisor). Note that personal data will be removed before we share the data on OSF (and other platforms where others can access the data).

Within this main folder (in UGent OneDrive), we will provide four seperate folders:

'1_Plans': all documents (in pdf or Word format) describing the background, study setup, data analysis plans.

'2_Materials': the questionnaires, poster used in the study, information and informed consent forms.

'3_Data': raw data in CSV format (unedited) and processed data.

'4_Analysis': Analytical R code and necessary outcomes.

Ethical and Legal Issues

How will you manage any ethics and confidentiality issues?

In this study, we will collect (digitally) personal data such as demographic information (e.g., gender and age) and the responses to the questionnaires. The demographic information will be used to describe the study population and the responses will be used to answer the research questions. In order to process or to share (e.g., on the OSF) the data anonymously, every participant will sign a digital informed consent form before entering the study. This consent can be withdrawn at any time of the study by informing the researcher. They will also receive an information form, with all the relevant information related to this study.

Before starting the study, the gym will also receive an information and informed consent form (previously discussed).

Personal data that might lead to an identification (e.g., gender and age) will be collected seperately from the responses on the questionnaires, and will be deleted after the analyses. Access to this data is restricted to authorized individuals only (e.g., the head researcher, the supervisor and co-supervisor). When processing/collecting the personal data the following data protection measures will be taken: enabling a filevault on the personal computer, using secure networks (e.g., a home network or UGent Virtual Private Network: VPN-connection), using UGent-account (with Multifactor authentication), storing the data in two secure locations (e.g., as will be discussed later: on UGent OneDrive and OSF) with restricted access to authorized individuals only. Note that personal data will be removed before we share the data on OSF (and other platforms where others can access the data).

The experiment and data processes will follow the General Data Protection Regulation (GDPR) of the Faculty of Psychology and Educational Sciences. Additionally, a Data Management Plan (DMP) will be established, where everything related to this study will be documented. Updates will also be registered. We will also pre-register the study on OSF (as previously discussed).

This project will not be submitted for approval of the ethical committee of the Faculty of Psychology and Educational Sciences since there will not be a deviation from the General Ethics Protocol (GEP).

How will you manage intellectual property rights issues?

The data will be property of the UGent. The are no other rights related to these data, so the processed data will be made publicly accessible on the OSF website.

Data Storage and Backup during Research

How will you store and backup data during research?

The data will be stored and backed up in two locations (previously discussed): (1) the researcher's personal UGent OneDrive storage space (i.e., storage on 'network drives') and (2) a folder on OSF.

The UGent OneDrive will function as the primary workspace during the data processing. It is a platform to store data on a Ghent University server connected to the local computer over the university network. Ghent University ICT Department (DICT) is in charge of security, maintenance and backup of the data.

We can recover the data from our backup location unless the data in that backup location is loss.

How will you ensure that stored data are secure?

The folder on OneDrive can only be accessed by authorized individuals with an UGent email adress (previously mentioned). In order to gain access to the UGent account a two-factor authentication process needs to be done.

The private folder on OSF is accessible only through the researcher's and (co-)supervisor's computers. When sharing data or making the folder public on OSF, all personal data will be removed.

Data Selection and Preservation after Research

Which data should be retained for preservation and/or sharing?

All the data will be kept for preservation and sharing. Personal data, such as gender and age, will be deleted when the analyses are done, and before sharing it on OSF website.

What is the long-term preservation plan for the selected datasets?

The data (excluding personal data, which will be removed) will be uploaded and made publicly accessible on the OSF website. We will be following the UGent rules (see https://www.ugent.be/en/research/openscience/datamanagement/during-research/storage.htm).

Data Sharing

Are any restrictions on data sharing required?

The personal data to be collected is limited (e.g., gender and age), and no names or email addresses will be collected. Since the data could be considered anonymous, there should be no further restrictions on data sharing.
Every participant will be asked to read and sign a digital informed consent before starting the study. Additionally, the gym will also receive an informed consent form (as previously mentioned).
The data will be shared on the OSF website, after removing the personal data.

How will you share data selected for sharing?

The (anonymized) data will be made publicly available via the OSF website, when the manuscript is done.

Responsibilities and Resources

Who will be responsible for data management?

The researcher will periodically review and update the data management plan, and oversee its implementation. The supervisor and co-supervisor will verify the content.
The researcher will finish the project and when she leaves UGent, the supervisor will take over the responsibilities.

Will you need additional resources to implement your DMP?

No additional recources are necessary.

Appendix 3: Online General Data Protection Regulation

Applying evaluative conditioning to combat obesity prejudice in gym environments

A Data Management Plan created using DMPonline.be

Creator: Kristien Bondarenko

Affiliation: Ghent University (UGent - UZ Gent)

Template: Generic DMP +

ID: 206505

Start date: 22-09-2023

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Last modified: 01-07-2024

Applying evaluative conditioning to combat obesity prejudice in gym environments
GDPR Record

Collection and processing of personal data

1. Are you collecting or processing personal data?

- Yes

Age and gender

2. In what format are you collecting or processing the personal data?

- Digital

Platform: lab.js (see https://lab.js.org/)

3. Are you collecting or processing primary personal data and/or secondary personal data?

- Primary personal data

We will collect primary data through an online informed consent form and online surveys.

4. If you are processing secondary personal data, will you inform the persons whose personal data are being processed or have they already been informed?

- No

Not applicable.

5. If no, explain why it is impossible or why it would take a disproportionate effort to inform the persons whose personal data are being processed.

Not applicable.

6. How will the personal data be processed?

- Anonymised (explain below)

The personal data to be collected is limited (e.g., gender and age), and no names or (email) addresses will be collected. The data could be considered anonymous. Personal data that might lead to an identification (e.g., gender and age) will be collected seperately from the responses on the questionnaires, and will be deleted after the analyses. Access to this data is restricted to authorized individuals only (e.g., the head researcher, the supervisor and co-supervisor).

7. If you are going to process personal data in a pseudonymised form, describe the method of pseudonymisation, where you will keep the key, and who has access to it.

Not applicable.

Categories of personal data & data subjects

8. Are you collecting/processing any of the following special categories of data?

- None of the above

9. Which other categories of personal data are you collecting/processing?

- Age
- Other personal or physical characteristics (specify below)

Gender

10. Whose personal data are you collecting/processing?

- Others (please specify below)

Adults (i.e., visitors of the gym) with no known issues or vulnerabilities, and sufficient comprehension of the Dutch language (i.e., the ability to speak and understand).

11. Will your research be seriously hampered if the persons whose personal data are being collected/processed exercise their right to access, to rectification, to restriction of processing, to be forgotten, to data portability and/or to object?

- No

No names are collected and the personal data is very limited (e.g., gender and age). If there is no possibility of identification based on this limited data, it will not be possible to correct inaccurate data or exercise your right to be forgotten (i.e., to have personal data deleted upon withdrawal of consent).

The participants can receive (via the researcher) a summary of the research findings after the study has been completed and the results are known.

12. If yes, please justify the need to deviate from one or more of the rights mentioned in question 11. A justification is required for each deviation.

Not applicable.

Purpose(s) of the processing

13. What is/are the purpose(s) of the personal data processing?

The personal data will be processed to describe the study population, identify potential demographic patterns, and advance scientific knowledge through psychological research studies.

14. What is the legal ground for the processing? If the data are being processed for multiple purposes, you must describe the legal ground for each purpose.

- The individuals participating in the research have freely given their explicit consent for the processing of their personal data for one or more specific purposes.

15. If you are processing special categories of personal data (see question 8), on which exception is this based?

Not applicable.

GDPR responsibility

16. Which institution(s) is/are involved in the research?

- Ghent University

17. Is there another university, hospital, research institute or partner involved in the research (besides Ghent University and/or Ghent University Hospital)? If yes, specify below.

- No

18. Please specify who determines the purposes ('why') and the means ('how') of the research.

- This is determined within Ghent University: UGent is the data controller.

Data transfers & categories of recipients

19. Are you disclosing/sharing/transferring personal data beyond your project team, either with recipients in UGent or UZ Gent, or with external recipients during or after your research?

- Yes

Data will be stored in a folder on the researcher's UGent OneDrive Network (Microsoft 365) and in a private folder on Open Science Framework (OSF). Access to this data is restricted to authorized individuals only (e.g., the head researcher, the supervisor and co-supervisor).

All data will be anonymized (e.g., personal data will be removed after the analyses) and made available on the OSF website to share with other researchers. The participants will be informed about our data plan via an (online) informed consent form. We will be following the UGent rules (see https://www.ugent.be/en/research/openscience/datamanagement/during-research/storage.htm).

20. If yes, to or with which categories of recipients are the personal data being disclosed/shared/transferred?

- Other researchers within your department
- Others (please specify below)

All data will be shared with my supervisor and co-supervisor for academic purposes (e.g., grading, supervision and guidance).

The participants can receive, on request (via the researcher), a summary of the research findings after the study has been completed and the results are known.

21. If yes, where are the personal data being disclosed/shared/transferred to?

- Belgium
- An international organisation (please specify below, including the location of the organisation)

The OSF website (see https://osf.io/).

22. What is/are the purpose(s) of the data transfer?

For academic (previously discussed) and open science purposes.

23. What is the legal ground for the data transfer? If there will be multiple data transfers, you need to indicate the legal ground for each data transfer.

- The individuals participating in the research have freely given their explicit consent for the transfer of their personal data for one or more specific purposes.

Retention period

24. What is the envisaged retention period for the different categories of personal data? Please motivate.

The limited personal information (e.g., gender and age) will be deleted after the analyses are done, and before sharing it on the OSF. No names or (email) adresses will be collected. The data could be considered anonymous and will be retained for an unlimited period.

We will follow the General Ethics Protocol (GEP; the storage of all relevant data and documentation for a minimum of five years after achieving the study's aims or publishing the data).

Risk analysis

25. To analyse the possible risks associated with the processing of personal data, please tick the boxes that apply to this research.

- Personal data are processed on a large scale (please consider the number of data subjects concerned, either as a specific number or as a proportion of the relevant population).

Number of data subjects: 102 (51 subjects in each condition: experimental and control). According to the power analysis, if the effect size is .50 and the power is .80. We will aim to recruit 120 participants in case of drop out or missing data (which is 15-20% more than the initial goal).

26. Does the research constitute a probable high-risk processing? If you ticked two or more boxes in question 25, the answer is 'yes'.

- No

Security measures

27. What technical and organisational security measures are in place to protect personal data?

- I hereby confirm that I carry out my research in accordance with the guidelines on information security of UGent and/or UZ Gent.

When processing/collecting the personal data the following data protection measures will be taken: enabling a filevault on the personal computer, using secure networks (e.g., a home network or UGent Virtual Private Network: VPN-connection), using UGent-account (with Multifactor authentication), storing the data in two secure locations (in a private folder on UGent OneDrive and OSF) with restricted access to authorized individuals only, anonymizing data before publicing on OSF.

28. If you have motivated the need to deviate from one or more of the rights of the persons whose personal data you are collecting/processing in question 11 and 12, please describe which safeguards are put in place to protect their rights and freedoms.

Not applicable.

Appendix 4: Data Analysis Plan

Data Analysis Plan

Data-preparation and data processing:

We will include the data of all participants/visitors of the gym who completed the entire study (i.e., who completed the first and second questionnaire), who are 18 years or older and speak/understand Dutch. We will exclude participants who did not indicate seeing the poster or did not report anything that was actually in the poster for the poster question, who did not fill out the second questionnaire, individuals who have been to the gym earlier that same day or the previous day, and demand compliant/reactant participants.

Analyses:

1. **Confirmatory analyses:**
   T-tests:
   We will perform one-tailed t-tests checking if:
   (1) There is a significant reduction in the self-reported stereotypical beliefs ('Overweight people are lazy' and 'Overweight people lack motivation to exercise') for the inferential EC group after the intervention (hypothesis H1a).
   (2) The reduction in the self-reported stereotypical beliefs after the intervention is greater for the inferential EC group than for the control EC group (hypothesis H1b).

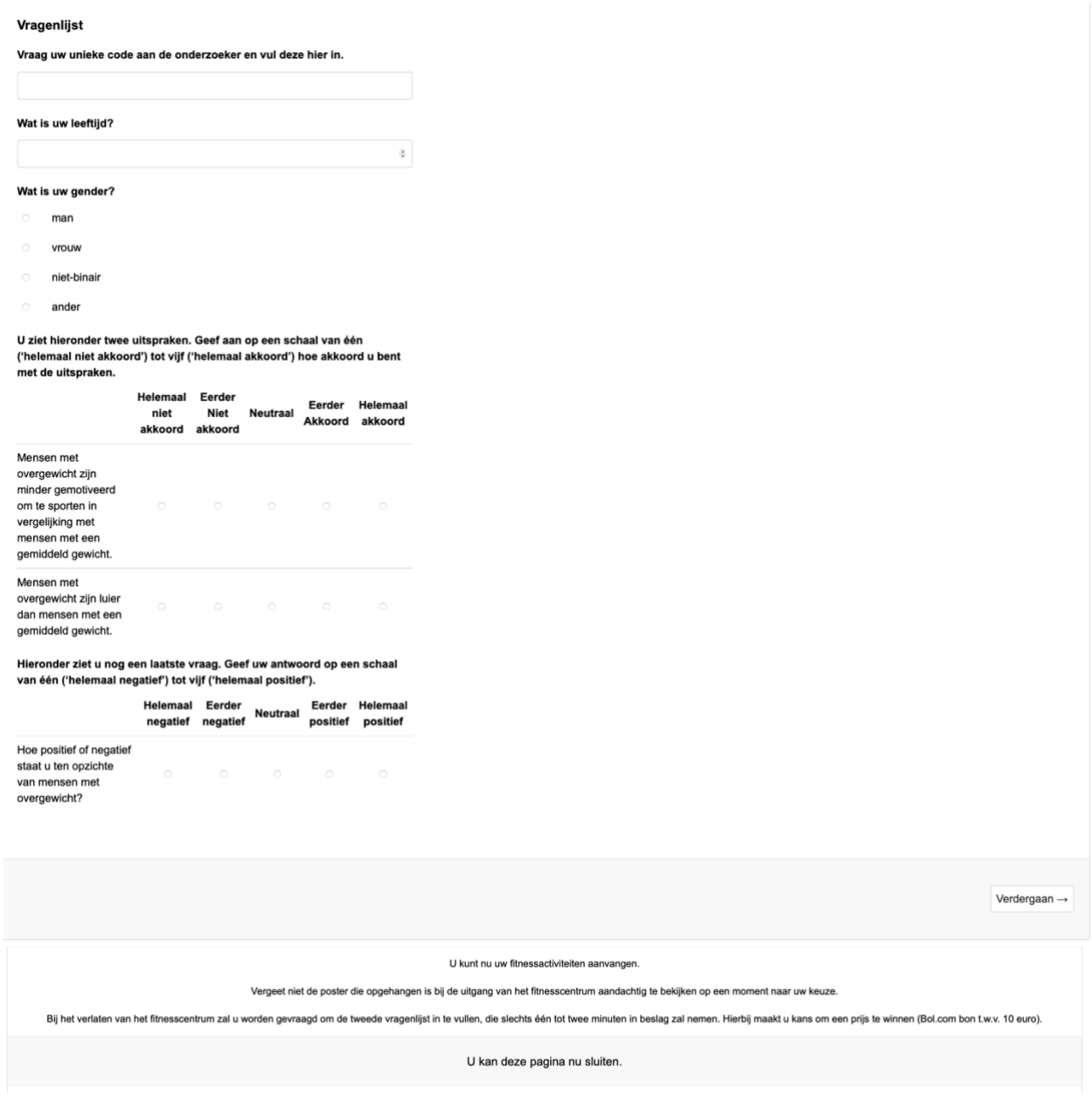
For these analyses, we will report Cohen's d and the Bayes Factor computed with ttestBF from the BayesFactor library in R with a prior of the effect size that we expect at the start.

We will run an additional test (via the lmer-function to fit a linear mixed-effects model) to check the robustness of the effect. We will control for the effect of the day and baseline scores.

2. **Exploratory analysis** for which we do not have directed hypotheses and that are more exploratory in nature (e.g., due to the limited amount of research in natural settings).
   We will perform separate t-tests checking if:
   (1) There is also a reduction/effect in the self-reported stereotypical beliefs ('Overweight people are lazy' and 'Overweight people lack motivation to exercise') in the control group after the intervention.
   (2) There is an effect on the overall evaluation in the experimental group and in the control group.
   (3) There is a difference in effect between the experimental and control group.

Appendix 5: Content of the questionnaires (in Dutch)

The first questionnaire



Vragenlijst

Vraag uw unieke code aan de onderzoeker en vul deze hier in.

Wat is uw leeftijd?

Wat is uw gender?

- man
- vrouw
- niet-binair
- ander

U ziet hieronder twee uitspraken. Geef aan op een schaal van één ('helemaal niet akkoord') tot vijf ('helemaal akkoord') hoe akkoord u bent met de uitspraken.

	Helemaal niet akkoord	Eerder Niet akkoord	Neutraal	Eerder Akkoord	Helemaal akkoord
Mensen met overgewicht zijn minder gemotiveerd om te sporten in vergelijking met mensen met een gemiddeld gewicht.					
Mensen met overgewicht zijn luier dan mensen met een gemiddeld gewicht.					

Hieronder ziet u nog een laatste vraag. Geef uw antwoord op een schaal van één ('helemaal negatief') tot vijf ('helemaal positief').

	Helemaal negatief	Eerder negatief	Neutraal	Eerder positief	Helemaal positief
Hoe positief of negatief staat u ten opzichte van mensen met overgewicht?					

Verdergaan →

U kunt nu uw fitnessactiviteiten aanvangen.

Vergeet niet de poster die opgehangen is bij de uitgang van het fitnesscentrum aandachtig te bekijken op een moment naar uw keuze.

Bij het verlaten van het fitnesscentrum zal u worden gevraagd om de tweede vragenlijst in te vullen, die slechts één tot twee minuten in beslag zal nemen. Hierbij maakt u kans om een prijs te winnen (Bol.com bon t.w.v. 10 euro).

U kan deze pagina nu sluiten.

The second questionnaire

Vragenlijst 2

Vul hieronder enkele vragen in. Geef steeds een eerlijk antwoord op basis van uw mening op dit moment. Uw antwoorden zijn steeds anoniem.

Vul de unieke code, die u in het begin heeft ontvangen, opnieuw in. U kunt dit best navragen bij de onderzoeker.

Wat is uw leeftijd?

U ziet hieronder twee uitspraken. Geef aan op een schaal van één ('helemaal niet akkoord') tot vijf ('helemaal akkoord') hoe akkoord u bent met de uitspraken.

	Helemaal niet akkoord	Eerder Niet akkoord	Neutraal	Eerder Akkoord	Helemaal akkoord
Mensen met overgewicht zijn minder gemotiveerd om te sporten in vergelijking met mensen met een gemiddeld gewicht.	○	○	○	○	○
Mensen met overgewicht zijn luier dan mensen met een gemiddeld gewicht.	○	○	○	○	○

Hieronder ziet u nog een vraag. Geef uw antwoord op een schaal van één ('helemaal negatief') tot vijf ('helemaal positief').

	Helemaal negatief	Eerder negatief	Neutraal	Eerder positief	Helemaal positief
Hoe positief of negatief staat u ten opzichte van mensen met overgewicht?	○	○	○	○	○

Verdergaan →

Vragenlijst 2 Einde

Vul hieronder nog deze laatste vragen in.

Heeft u de poster bij de uitgang bekeken?

- ○ ja
- ○ nee

Wat stond er op de poster?

U hebt zonet drie vragen beantwoord over mensen met overgewicht. We willen graag weten of uw antwoorden op deze vragen eerlijk waren en uw echte mening reflecteren, of dat u niet eerlijk was en uw antwoorden veranderd hebt enkel om zo mee te gaan met wat u dacht dat de onderzoekers zouden willen dat u zou antwoorden.

- ○ Ik gaf eerlijke antwoorden.
- ○ Ik gaf oneerlijke antwoorden omdat ik aan de onderzoekers wou doen geloven dat de poster BETER werkt dan eigenlijk het geval is.
- ○ Ik gaf oneerlijke antwoorden omdat ik aan de onderzoekers wou doen geloven dat de poster SLECHTER werkt dan eigenlijk het geval is.

Verdergaan →

Bedankt voor uw deelname aan dit onderzoek!

Ga nu naar de onderzoeker en maak kans op het winnen van een prijs (Bol.com bon t.w.v. 10 euro).

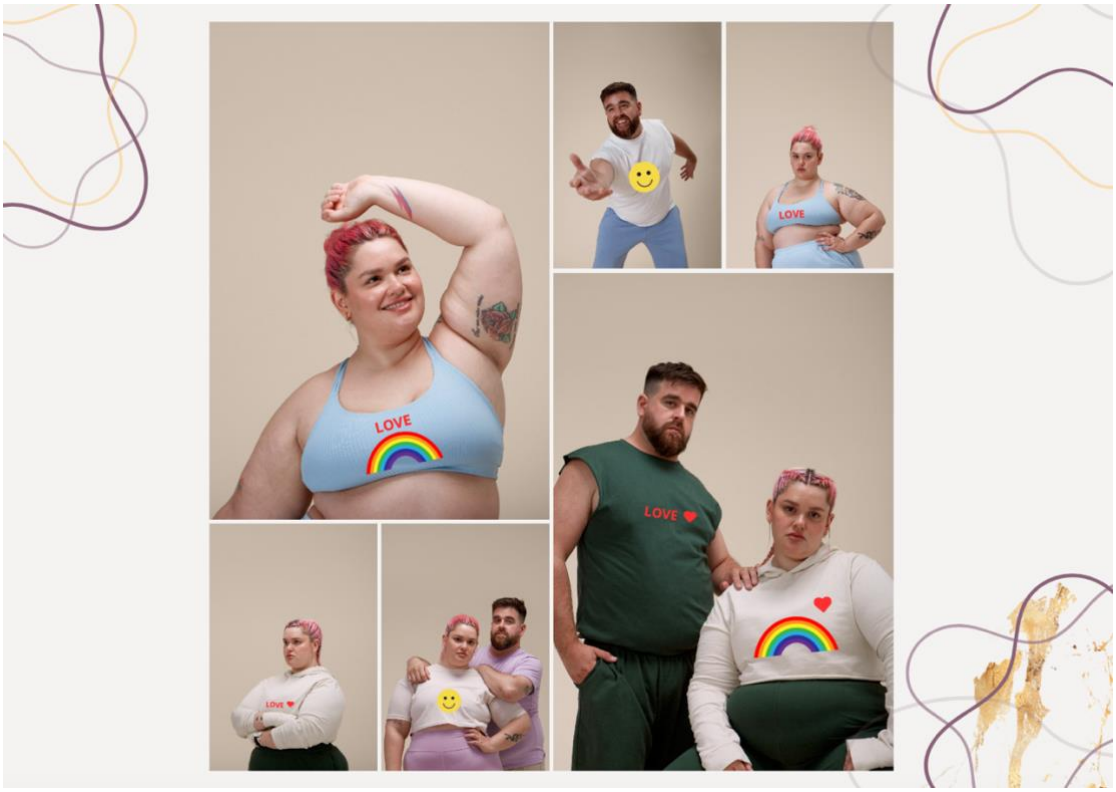
Indien u vragen heeft of meer informatie omtrent de studie wenst, kan u de onderzoeker aanspreken. Meer informatie kan u dan op een later moment bezorgd worden.

U kan deze pagina nu sluiten.

Appendix 6: Content of the posters (size 670 mm x 950 mm)

Experimental condition: inferential EC-based poster

Control condition: traditional EC-based poster



Appendix 7: Flyer with QR code (in Dutch)

Two flyers with identical designs were used in this study.

Appendix 8: List with unique participation codes

Participation Code	Name of participant	Condition? inferential EC poster control EC poster	Study finished? *(Place a check mark √)*
1.		Inferential / control	
2.		Inferential / control	
3.		Inferential / control	
4.		Inferential / control	
5.		Inferential / control	
6.		Inferential / control	
7.		Inferential / control	
8.		Inferential / control	
9.		Inferential / control	
10.		Inferential / control	
11.		Inferential / control	
12.		Inferential / control	
13.		Inferential / control	
14.		Inferential / control	
15.		Inferential / control	
16.		Inferential / control	
17.		Inferential / control	
18.		Inferential / control	
19.		Inferential / control	
20.		Inferential / control	
21.		Inferential / control	
22.		Inferential / control	
23.		Inferential / control	
24.		Inferential / control	
25.		Inferential / control	
26.		Inferential / control	
27.		Inferential / control	
28.		Inferential / control	
29.		Inferential / control	
30.		Inferential / control	
31.		Inferential / control	
32.		Inferential / control	
33.		Inferential / control	
34.		Inferential / control	
35.		Inferential / control	
36.		Inferential / control	
37.		Inferential / control	
38.		Inferential / control	
39.		Inferential / control	
40.		Inferential / control	
41.		Inferential / control	
42.		Inferential / control	
43.		Inferential / control	

Appendix 9: Information and informed consent form gym (in Dutch)

FACULTEIT PSYCHOLOGIE EN PEDAGOGISCHE WETENSCHAPPEN

Onderzoek naar de overtuigingen van bezoekers aan de gym

Beste,

Bezoekers van jullie gym worden uitgenodigd om deel te nemen **aan een studie van de Universiteit Gent**, uitgevoerd door een tweedejaars masterstudent in de Klinische Psychologie. Lees deze brief grondig door en neem contact op indien u vragen heeft. Eens u beslist heeft dat u akkoord bent met het uitvoeren van deze studie kan u beslissen om het toestemmingsformulier te ondertekenen.

De verantwoordelijke onderzoekers zijn:

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1. Informatie over de studie

We onderzoeken overtuigingen en vooroordelen tegenover mensen met obesitas/overgewicht (= doelstimulus) in sportomgevingen, waar de prevalentie van vooroordelen uit onderzoek hoog blijkt te zijn. Dit onderzoek zal nagaan wat het effect is van een eenvoudig te implementeren interventie, in de vorm van een poster, op deze (stereotypische) overtuigingen. De poster is gebaseerd op recent onderzoek en theorieën over evaluatieve conditionering en inferentieel redeneren.

Studieopzet

Deze studie bestaat uit het **invullen van twee digitale vragenlijsten** (één aan het begin en één aan het einde van het gymbezoek) en het **bekijken van een poster** (opgehangen in het fitnesscentrum). Het invullen van de vragenlijsten gebeurt digitaal, via een QR-code die de participanten scannen met hun telefoon, en neemt ongeveer één tot twee minuten in beslag.
Het onderzoek zal plaatsvinden tijdens de openingsuren van het centrum, met één aanwezige onderzoeker om de studie te begeleiden en vragen te beantwoorden. De studie zal twee dagen duren, bij voorkeur op de twee drukste dagen.

Het verloop van de studie:

UNIVERSITEIT GENT

1. Wanneer de bezoekers van de gym (= participanten) binnenkomen in het fitnesscentrum, worden ze door de onderzoeker gevraagd om deel te nemen aan het onderzoek. Als ze instemmen, ontvangen ze een QR-code met een link naar een digitale informatiebrief over de studie en een digitaal toestemmingsformulier. Daarna worden ze gevraagd om de eerste vragenlijst in te vullen, waarin er enkele vragen gesteld worden over (1) demografische gegevens (*gender en leeftijd*), (2) over stereotypische overtuigingen en (3) de evaluatie van de doelstimulus.
2. Nadat de deelnemers de documenten hebben doorgenomen (en ondertekend) en de eerste vragenlijst hebben ingevuld, kunnen ze aan hun fitnessactiviteiten beginnen. Ze worden wel gevraagd om kort de poster, die opgehangen is in het fitnesscentrum, te bekijken. Dit kan op een zelfgekozen moment, zolang het maar gebeurt voordat ze vertrekken.
3. Bij vertrek worden de participanten gevraagd om een tweede vragenlijst in te vullen die polst naar dezelfde stereotypische overtuiging en de evaluatie van de doelstimulus. Hierbij maken de participanten een kans om een bon van Bol.com (t.w.v. 10 euro) te winnen. De winnaar wordt ter plaatse gekozen door het trekken van een 'winnend' lot uit een pot vol lootjes.

Deze opzet wordt op de tweede dag van de studie herhaald.

De deelname is **volledig vrijwillig**. De participanten mogen zich op elk moment terugtrekken uit de studie zonder een reden op te geven.
De participanten kunnen, als ze dit wensen, een samenvatting van de onderzoeksbevindingen krijgen nadat de studie afgerond is en de resultaten bekend zijn. Om een samenvatting te krijgen, kan dit navraagd worden bij de onderzoeker waarmee ze contact hebben gehad.
Aan dit onderzoek is geen enkel gekend risico verbonden.

De studie wordt uitgevoerd volgens de richtlijnen uit het Algemeen Ethisch Protocol van de Faculteit Psychologie en Pedagogische Wetenschappen (Universiteit Gent)[1]. De onderzoekers voeren dit onderzoek uit in overeenstemming met de geaccepteerde maatstaven voor wetenschappelijk en ethisch gedrag. Hierbij hanteren ze goede onderzoekspraktijken en houden zij zich aan de principes van onderzoeksethiek zoals beschreven in 'Ethics in Social Science and Humanities' (EU, 2018)[2].

[1] https://www.ugent.be/pp/nl/onderzoek/ec#Regelsenprotocollen
[2] https://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020_ethics-soc-science-humanities_en.pdf

Wat wordt van u verwacht of van de gym medewerkers?

Voor deze studie hoeft u of de gym medewerkers niets uit te voeren. We vragen alleen om **toestemming om de bezoekers van de gym aan te spreken** en om **een poster op te hangen** in het fitnesscentrum.

2. Privacy en persoonsgegevens

De onderzoekers dienen zich te houden aan de generieke gedragscode voor de verwerking van persoonsgegevens van de UGent[3]. In overeenstemming met de Europese en Belgische privacywetgeving[4] wordt de persoonlijke levenssfeer van deelnemers gerespecteerd. Voor het verwerken van de persoonsgegevens van uw leden zal er expliciete toestemming gevraagd worden. Dit gebeurt via het ondertekenen van een digitaal toestemmingsformulier. Deze toestemming kan ten alle tijden worden ingetrokken door dit te melden aan de onderzoeker.

De volgende persoonsgegevens zullen worden verzameld (met behulp van twee digitale vragenlijsten) en verwerkt:

- **Gender en leeftijd**
- **Antwoorden op de twee vragenlijsten met betrekking tot overtuigingen**

De leeftijd en gender zullen gebruikt worden voor de beschrijving van de mensen die deelnemen aan de studie. De antwoorden op de vragenlijsten zullen worden gebruikt om onderzoeksvragen te beantwoorden.

[3] https://www.ugent.be/nl/univgent/privacy/gedragscode-persoonsgegevens.htm
[4] Dit zijn: de Europese Algemene Verordening Gegevensbescherming 2016/679 van 27 april 2016, die van kracht is sinds 25 mei 2018 (dit is de AVG of GDPR); de Belgische Wet betreffende de bescherming van natuurlijke personen met betrekking tot de verwerking van persoonsgegevens van 30 juli 2018.

3. Toestemmingsformulier

Dit deel wordt losgemaakt en (ondertekend) terugbezorgd aan de hoofdonderzoeker (Kristien Bondarenko)

A. Toestemming m.b.t. deelname aan de studie

Gelieve het juiste bolletje aan te kruisen	**Ja**	**Nee**
Mijn fitnesscentrum geeft vrijwillig de toestemming om deze studie uit te voeren.	o	o
Ik weet dat mijn fitnesscentrum op elk ogenblik uit de studie mag terugtrekken zonder een reden voor deze beslissing op te geven en zonder dat dit op enige wijze een invloed zal hebben op de verdere relatie met de onderzoeker.		
Ik heb het informatieformulier gelezen en heb voldoende uitleg gekregen over de aard, het doel, de duur, en de voorziene effecten van de studie. Ik kreeg de gelegenheid om vragen te stellen en ik heb op al mijn vragen een bevredigend antwoord gekregen.		

Naam fitnesscentrum
Naam verantwoordelijke
Datum
Handtekening

Appendix 10: Map of the gym facility