Communauté
UNIVERSITÉ Grenoble Alpes

THÈSE

Pour obtenir le grade de

DOCTEUR DE LA COMMUNAUTE UNIVERSITE GRENOBLE ALPES

Spécialité : Mouvement et comportement pour la santé et l'autonomie

Arrêté ministériel : 25 mai 2016

Présentée par

Ahuitz ROJAS-SÁNCHEZ
Thèse dirigée par Aïna CHALABAEV, Professeure des Universités, Université Grenoble-Alpes, et
Codirigée par Philippe SARRAZIN, Professeur des Universités, Université Grenoble-Alpes

Préparée au sein du **Laboratoire Sport et Environnent Social,**
Dans l'École Doctorale Ingénierie pour la Santé et l'Environnement

Weight Stigma's Relationship to the Practice and Maintenance of Physical Activity.

Thèse soutenue publiquement le 18 décembre 2019,
Devant le jury composé de :

Mr Julien BOIS
Professeur des universités à l'Université de Pau, Rapporteur

Mr Paul FONTAYNE
Professeur des universités à l'Université Paris Nanterre, Rapporteur

Mme Julie BOICHÉ
Maitre de Conférences, HDR, à l'Université de Montpellier, Examinatrice

Mr Corentin CLÉMENT-GUILLOTIN
Maitre de Conférences, HDR, à l'Université Côte d'Azur, Examinateur

Mme Aïna CHALABAEV
Professeure des universités, à l'Université Grenoble-Alpes, Directrice de thèse

Mr Philippe SARRAZIN
Professeur des universités, à l'Université Grenoble-Alpes, Directeur de thèse

Index

Acknowledgments

I would like to start by thanking professors **Philippe** and **Aïna**, my directors throughout this doctoral work. My thanks to Aïna for her patience while I learned French, statistics and what it meant to be a PhD student. Thank you for guiding my work and untangling my messy ideas. Philippe, thank you for your support and sharp comments in all the crucial moments. A single comment from you generally led me to question everything that had been done so far and had me searching for ways to improve myself.

All my thanks to professors **Julien Bois** and **Paul Fontayne** for accepting to review this doctoral work. My thanks also to **Julie Boiché** and **Corentin Clément-Guillotin** for accepting to be part of my jury and providing their expertise and evaluation of my work. I am sure your feedback will greatly influence my future work.

I would particularly like to thank **Gayatri**, **Miguel Davó**, **Reshma(shree)**, for their friendship and support. Gayatri, thank you for changing my whole approach to my PhD experience. Your advice in statistics and life (often the same thing) made my experience more manageable and helped me structure the way I worked. Miguel, thank you for helping me keep an active lifestyle, as well as for always questioning the validity of social sciences, this helped me look for new ways to measure and think about psychology. And Reshma, thank you for your unconditional support, your delicious food and your willingness to hear me rant about everything non-stop.

My thanks to those who embarked on the PhD with me **Cyril**, **Clément**, and **Olivier**. Cyril, thank you for your constant good mood, and 'can-do attitude', it was always encouraging seeing your passion for research expressed through your sense of humor. Clément, thank you for being an inspiration, you are undoubtably the hardest working of us

all. Thank you, Olivier, for our talks about statistics, methods and other unrelated but frankly more enjoyable stuff.

I would also like to particularly thank **Boris**, for providing guidance, remarkable wit and of course some code without which my second study would not have been possible.

My thanks to my colleagues at the labo SENS for all their help, support and patience when we couldn't communicate in any other way than through charades. **Silvia**, thank you for being my friend. **David**, along with Cyril thank you both for our long talks at Dr. D. It was almost all of the non-office contact I got those last few months. **Geraldine**, thank you so much for lending me those children's books when I first got here. You have no idea how much they helped, at least in making me feel welcomed. **Claudia**, you've been here a short time but having someone to talk about home with makes such a big difference. **Gwén** thank you for helping me with my statistics for my first ever quantitative study. **Valentin**, it's been a pleasure sharing an office, thank you for that; and **Sandrine** thank you for your administrative support.

My thanks to my collogues back in México that helped with bringing me here through teaching, guidance and friendship. Thank you, **Sebastian**, and **Edilberto**.

To my friends, most of which left Grenoble a while ago. Thank you **Resh, Claude, Asif, Yashank, Ricardo, Sudishna, Supriya, Sarah, Daulet, Ellie**, and everyone that made my stay in France easier.

I would also like to thank **CONACYT** for their financial support over the last couple of years. Without it, this thesis would not have been possible.

Mady, thank you for all the support you have given me in the last couple of years. You have been the constant in this adventure, and I simply don't think I would be where I am today if we hadn't met. Thank you for believing in me and reminding me that not everything is work. Thank you for the hours you have spent talking about discrimination, stigma and privilege, maybe you should be the one getting the PhD. Thank you for you.

Papá, conociéndote como te conozco ya estas haciendo planes para leer esta tesis. Créeme que no es necesario. Hace 8 años tu tuviste la mayor parte de las ideas que aquí presento. Tú eres el que siempre me ha encaminado a sumar, no restar. A siempre utilizar todas mis herramientas. Creo que sin ti nunca hubiera tenido el valor de volver a empezar mi aprendizaje de programación sin el cual nada de esto habría funcionado. Gracias por tu apoyo y, sobre todo, gracias por la disciplina que me has dado.

Mamá, muchas gracias por tu confianza y por tu apoyo. Sé que no hay nadie en el mundo que cree en mi como tu lo haces y eso me motiva a mejorar. Gracias por lo que yo creo son cientos de horas en mensajes de audio las primeras de las cuales son en su mayoría de ti convenciéndome de no rendirme, de seguir a pesar de la brecha cultural y de idioma, y de lo mucho que los extraño. Sin ti no sería el hombre que soy hoy.

Introduction

Obesity has been named of the most important health risks facing humanity right now (OECD, 2017). The Body Mass Index (BMI) is determined by the body mass divided by the square of the body height and is expressed in units of kg/m^2 (Center for Disease Control, CDC, 2016). A person with a BMI higher than 25 is considered overweight. Higher than 30 is considered obese. In 1972, 45% of Americans were overweight and by the year 2000 that number went up to 62%. For comparison, in Korea (the country with the lowest rate of obesity of the Organization for Economic Co-operation and Development, OECD) the rate was 5.3% in 2015 (OECD, 2017). These rates illustrate the fast-passed growth of overweight and obesity around the globe. As of 2015, these rates have kept increasing, with an estimated 107.7 million obese children and 603.7 million obese adults worldwide, which accounts for around 5% of the child population and 12% of the adult population (GBD 2015 Obesity Collaborators, 2017).

This worldwide increase is marked by differences between countries. The richness of a country has been shown to have drastic effects on the weight of its inhabitants, which is higher in individuals living in low and middle income countries (GBD 2015 Obesity Collaborators, 2017). Countries with marked cultural and economic differences like France and Mexico, for example, have vastly different rates of obesity with 15.3% and 32.4% of obese population respectively (OECD, 2017).

The differences in obesity rates is accompanied by increases in mortality and several comorbidities. Using the standard Center for Disease Control index for classifying obesity (CDC, 2016), a BMI above 29 is associated with diabetes, cancer, arthritis, and cardiovascular diseases (GBD 2015 Obesity Collaborators, 2017). Obesity has also been related to higher blood pressure (Must et al., 1999) and it is assumed responsible for 7% of all total deaths in 2015. In that same year, it contributed to 120 million disability-adjusted life-

years, leaving cardiovascular diseases (an obesity-related disease) as the leading cause of death for that year, and diabetes as the second one (GBD 2015 Obesity Collaborators, 2017).

At the psychological level obesity has also been linked to higher risk of psychiatric disorders like depression, anxiety (Fabricatore & Wadden, 2004), and poor perceived health (Carr & Friedman, 2005; Visscher et al., 2017), with the latter being highly related to mortality (Idler & Benyamini, 1997).

Given these consequences, efforts have been made to better understand the causes of obesity. Its etiology is complex, as it has been shown to have biopsychosocial roots that are not easily disentangled. Different contributing factors have been identified, such as biological (i.e., Le Chatelier et al., 2013; Ouchi, Parker, Lugus, & Walsh, 2011), socio-economic (Harrington, 2008; Webb, Prentice, & Webb, 2006), and psychological factors (Fan & Jin, 2014).

Among the biological mechanisms of obesity, energy balance is one of the main mechanisms through which obesity is usually explained (Trayhurn, 2005). This mechanism has three basic components that are supposed to determine the weight of the individual: energy intake, energy expenditure, and energy storage (Reilly et al., 2004). Body weight changes when energy intake differs from expenditure, increasing when the difference is positive and decreasing when negative.

The energy balance system is nevertheless not as straightforward as it seems. Previous research has shown that this system has a much stronger opposition to weight loss than to weight gain, suggesting that losing weight is harder than gaining it (Hall et al., 2011). This can be due to a number of different factors and is thus not limited to simple imbalances in energy intake and expenditure (Hall et al., 2011; Le Chatelier et al., 2013).

In their review of genetic factors of obesity, Choquet and Meyre (2011) noticed, for example, that individuals with a specific set of genetic conditions can attain weight loss

effectively with behavioral modifications like diet and exercise, while other genes might be responsible for adiposity accumulation regardless of lifestyle modifications.

The richness of gut microbiome is another biological example that has been shown to be highly correlated with metabolic markers, determining not only adiposity levels of individuals, but also associated comorbidities (Le Chatelier et al., 2013). Individuals with lower bacterial richness have been shown to gain more weight over time.

Advances in understanding obesity seem to have negligible effect on its treatment. Despite all the evidence suggesting external causes, obesity is seen as a treatable disease mainly related to individual behaviors, rather than as a condition associated with diseases (Rosen, 2014). The main objective of the treatment of obesity is reduction of body weight and maintenance of that weight loss. Treatment options are pharmacological, surgical, and/or behavioral (Cannon & Kumar, 2009).

In the case of the pharmacological option, current available medication focuses on weight loss and can be classified into two groups: anorexiants, whose main course of action is to suppress appetite and thus limit calorie intake; and the lipase inhibitors, which aim to reduce the absorption of dietary fat in the gut (Cannon & Kumar, 2009). The first type implies that consumption of all types of foods is reduced, which, unless medically and dietary supervised, could have a negative impact on the overall nutrient consumption of the individual.

Bariatric surgery is the main surgical option available for the treatment of obesity. It works in two complementary ways, through malabsorptive and restrictive procedures, which involve reducing appetite. The malabsorptive component involves shortening the length of the small intestine, thus decreasing time during which digestion and absorption of nutrients can occur (Cannon & Kumar, 2009). Similar to the pharmacological options, this could lead

to dietary deficiencies and place the overall focus of the treatment on the dietary habits of the patient.

Both weight loss medication and surgery are usually recommended as part of a comprehensive weight loss program, that includes not only dietary recommendations, but also physical activity ones (Cannon & Kumar, 2009). Indeed, surgery candidates must be committed to long-term lifestyle changes, as well as pre-surgery weight loss through behavioral modifications, which are associated with fewer complications after gastric bypass surgery (Benotti et al., 2009). This speaks to the importance of lifestyle changes in the medical treatment of obesity, physical activity and diet having both positive effects on the overall health of patients with and without obesity (Butryn, Webb, & Wadden, 2011; Janssen & LeBlanc, 2010).

An important lifestyle requirement for the treatment of obesity is physical activity. Physical activity is a concept that encompasses all body movement produced by voluntary muscular action that increases the metabolic expenditure (Caspersen, Powell, & Christenson, 1985). This means that exercise, which is planned, structured and repetitive movement, as well as leisure activities that require movement are included within the concept.

Physical activity is widely regarded as one of the most effective behaviors for health maintenance and disease prevention (Warburton, Nicol, & Bredin, 2006). Research supports the notion that virtually anyone can benefit from the practice of physical activity, from children to the elderly (Janssen & LeBlanc, 2010; Warburton & Bredin, 2017). These benefits are also generalizable to different socioeconomic statuses, since recent studies have found the same benefits in low, middle and high income countries (Lear et al., 2017).

The World Health Organization (WHO) recommends 150 min/week of moderate-to-vigorous physical activity for the benefits of physical activity to occur (WHO, 2010). These benefits have mostly been associated with cardiovascular and metabolic health, including an

increase in the performance of the heart, reduction of resting heart rate, improved circulation, general improvement of blood flow going to the organs, arterial resistance reduction, improved glucose metabolism, low density lipoprotein (LDL) reduction and increase of high density lipoprotein (HDL), weight loss and obesity prevention, reduced blood pressure, and increased self-reported well-being (WHO, 2010).

Physical activity's many benefits tend to be overshadowed by the focus on its effects on weight loss (Blair & LaMonte, 2006), especially when talking about obesity. This is to say that experts and laypeople tend to measure the effectiveness of physical activity programs on a single criterion: weight loss (i.e., Harris, Cale, Duncombe, & Musson, 2018).

While physical activity helps support weight loss attainment and maintenance to a small degree (Catenacci & Wyatt, 2007; Westerterp, 2019), the health benefits of physical activity have a higher value for individuals with obesity (Lee et al., 2005). Improvement in maximum oxygen consumption, reduced depressive symptoms and improved muscle strength have been found in obese individuals without weight-loss (Sarsan, Ardiç, Özgen, Topuz, & Sermez, 2006). Another study showed that despite the absence of weight loss, moderate-intensity exercise was associated with significant reductions in total and abdominal fat in both obesity and Type 2 diabetes (Lee et al., 2005). A recent meta-analysis of family-based interventions to increase physical activity actually found that focusing the interventions on benefits/objectives other than weight loss was actually a good predictor of physical activity time increase (Brown et al., 2016). Despite this evidence however, most programs focus on weight loss instead of health promotion (Teixeira et al., 2015).

Focusing primarily on weight loss instead of health is problematic for a second – underexplored – reason: it may reflect a social devaluation of obesity. Research in social psychology suggests that this social devaluation and denigration of overweight and obese people (i.e., weight stigma) is pervasive (Major, Tomiyama, & Hunger, 2018). Indeed, weight

stigma experiences are common in overweight people's everyday lives, with 20.6% to 45.4% of obese adult females reporting daily weight discrimination (Puhl, Andreyeva, & Brownell, 2008). Weight stigma is prevalent in most life domains, including employment, health care, education, and the media (Puhl & Heuer, 2009).

Importantly, the social psychology approach proposes that weight stigma could be the main driver of obesity increase as well as its effects on health (Tomiyama et al., 2018). This provocative approach, which contrasts with the dominant biological approach, is based on the argument that weight stigma may trigger unhealthy behaviors, such as high calorie intake (Araiza & Wellman, 2017), binge eating (Durso, Latner, & Hayashi, 2012), and physical inactivity (Vartanian & Novak, 2011).

As previously mentioned, physical activity is an important factor towards health maintenance, but weight stigma might prevent individuals with obesity from practicing it (Lozano-Sufrategui, Carless, Pringle, Sparkes, & McKenna, 2016; Vartanian & Novak, 2011; Vartanian & Shaprow, 2008). This hinderance might occur because of societal associations of exercise, weight loss and stigma (J. K. Harris et al., 2018; Tiggemann, Churches, Mitchell, & Brown, 2018; Tiggemann & Slater, 2014), stigmatizing attitudes from exercise professionals (Panza et al., 2018), negative experiences practicing physical activity (Lozano-Sufrategui et al., 2016), and exercise avoidance (Vartanian & Novak, 2011).

This thesis aims to further understand the relationship between stigma and physical activity. In order to fully understand the relationship between physical activity, stigma and obesity it is important to understand where stigma can be found. Specifically, this thesis looks to understand the effect of weight stigma from different perspectives and at different levels of analysis: from the perceiver's perspective, it will look at social media (the macroscopic level) and at individual perceivers (the individual level), and from the target's perspective, it will look at the general population, and at people with obesity.

Introduction

This thesis is organized in the following way: the first four chapters will present the theoretical elements that underlie our approach, by defining stigma, exploring its origins and its dual representation (chapter one) then exploring how it affects response in the perceiver (chapter two), and the target of stigma (chapter three), and exploring its prevalence in different areas of everyday life (four). Chapter five presents the general problematic and gaps in the literature thus far and introduces the studies designed in this thesis to fill those gaps. The following chapters will present the studies carried out as part of this doctoral work. Chapter six will describe a study in which we examined the overlap between fat-talk and exercise-talk communities online. Chapter seven examined weight stigma and reflective/automatic responses in exercise science students as a function of weight and sex of target, and chapter eight will describe two studies that explored the interconnectedness of stigma processes as predictors of physical activity. A ninth and last chapter will then propose a general conclusion of this work

Chapter 1: Definitions, Origins, and Representation of Stigma

1.1. Defining Stigma

In order to define stigma, it is important to first describe the concepts of attitudes, prejudice, stereotypes, and discrimination. All these concepts serve as a basis for the understanding of the current study of stigma in psychological science. They have also evolved over time along with the study of intergroup relationships (Dovidio, Schelhaas, & Pearson, 2005). It is important to delve into the study of attitudes because of its focus on their influence in intergroup relations, especially toward members of socially devalued groups.

An attitude can be defined as an evaluation that can range from extremely negative to extremely positive and can be directed towards objects, individuals, groups, etc. (Albarracin, Johnson, Zanna, Johnson, & Zanna, 2014). The negative attitudes, which are referred to as prejudices, are defined by Allport (1954) as "an antipathy based on faulty and inflexible generalization that may be felt or expressed. It may be directed towards a group as a whole, or towards an individual if he is a member of that group" (p.9).

Stereotypes are a related but distinct concept. They are associations between a group, individual, object, or idea and the specific characteristics attributed to it by generalizations (Dovidio et al., 2005). In other words, prejudices are an affective component of attitudes, while stereotypes are a cognitive component.

As for stigma, most of the current thinking is based on Goffman's seminal work (1963). Based on ethnographic techniques he proposed that stigma was not a cognitive simplification or group membership association, but instead a socially produced reduction of the individual to a reduced being (Goffman, 1963). Goffman proposed the concept of "mark" to denote a physical or social characteristic that differences an individual from the norm, thus creating the possibility for stigma. He also proposed a typology of stigmas which separated them into "discredited" stigmas, which is to say stigmas that are known to others; or

"discreditable" stigmas or stigmas that can be concealed (Goffman, 1963). This brings to mind the "concealability" characteristic of stigma, along with "collectivity" and "controllability" that have been proposed by more recent scholars (Crocker, Major, & Steele, 1998; Dovidio, Major, & Crocker, 2000).

Current models addressing stigma seem to have wide commonalities with those studying prejudice, with only slight differences in the human characteristics being studied (Phelan et al., 2008). While models of prejudice tend to focus on race, the models of stigma tend to focus on disease. Otherwise, as long as there is exploitation and domination (keeping people down), norm enforcement (keeping people in), and disease avoidance (keeping people away) from one group to another, these two terms are talking about the same thing. In fact a review of models of prejudice and stigma found that the communalities were greater than the differences and thus prejudice and stigma are in fact "one animal" and not two (Phelan et al., 2008).

The focus of this thesis will be set on the definition of stigma provided by Crocker, Major, and Steele (1998) "stigmatized individuals possess (or are believed to possess) some attribute, or characteristic, that conveys a social identity that is devalued in a particular social context" (p. 505). In their definition there is a recognizable personal attribute that is devalued by others and they are then identified as belonging to a group more than as individuals, thus creating a social identity. This definition brings forward the possibility of analyzing not only the processes by which the individuals respond to that characterization, but the beliefs that give way to it and even the social context that allows for the characterization to take place.

Finally, discrimination is the behavioral consequence of prejudice against a specific group of people (Fiske, 1998). This means that while attitudes, prejudice, and stereotypes affect only the individual endorsing them, discrimination has implications on third parties.

1.2. Origins of stigma

Dovidio et al. (2005) distinguish three dominant perspectives in the study of stigma within intergroup relations (a) individual differences in personality and ideology; (b) dynamics of group categorization and social identity; and (c) social experience, social influence, and functional relations between groups.

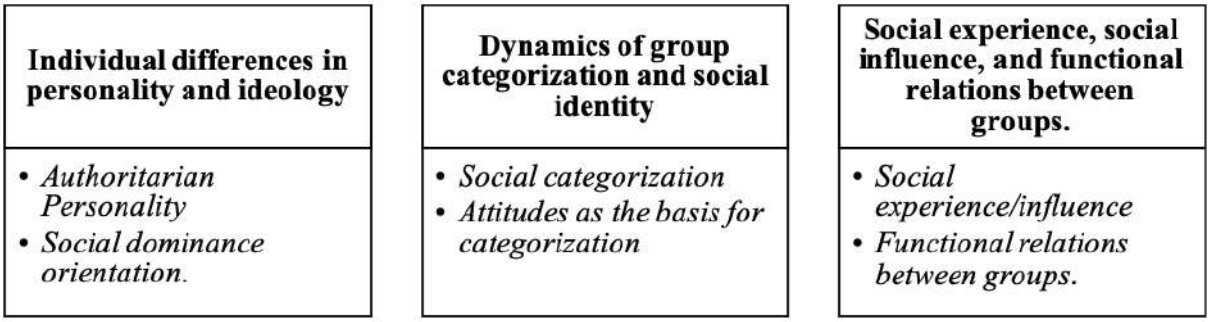


Figure 1. Graphic representation of current models of stigma.

1.2.1. Individual differences in personality and ideology.

The individual differences in personality and ideology perspective places the focus on the individual's characteristics as defining of intergroup relations. This is to say that personality or ideological features are the ones defining stigma against other groups rather than the characteristics of the stigmatized group themselves.

Within this line of work the concept of *Authoritarian personality* was developed (Adorno, Frenkel-Brunswik, Bettelheirn, & Janowitz, 1950). Individuals that scored high in that construct tend to submit to authority and conventional traditions and values and think in

rigid, all-or-nothing ways. Previous studies have shown that a higher need for structure and intolerance for ambiguity are good predictors of stigma (Hodson & Dhont, 2015).

An alternative explanation within this frame of thought is *Social dominance theory* (Pratto, Sidanius, & Levin, 2006). It emerged to explain how and why people within most societies organize themselves hierarchically according to age and sex, as well as with regard to a variety of culture-specific groups (e.g., ethnicity, race, religion). Social dominance orientation is the term coined for individuals who desire group-based dominance, reflected by a stable individual difference (Sidanius & Pratto, 1999). This construct has been robustly associated with higher levels of sexism, racism, and prejudice towards immigrants, lesbians, gay men, feminists, and physically disabled people (Sibley & Duckitt, 2008).

These results, coupled with a high correlation between different forms of stigma (i.e., racism, sexism, heterosexism, anti-Semitism, and xenophobia; Zick, Pettigrew, & Wagner, 2008) serve as strong arguments that individual differences in personality and ideology, rather than characteristics of the stigmatized group, identity, and social influence, are responsible for the high levels of stigmatization.

1.2.2. Dynamics of group categorization and social identity.

The dynamics of group categorization and social identity perspective highlights group membership as the key mechanism (Tajfel & Turner, 1997). The social identity perspective states that in social situations individuals can perceive themselves in terms of group membership in reference to others. In other words, individuals rely on cognitive mechanisms to create a social identity that aligns with one group (or more) but not others. In that sense, an ingroup and an outgroup is mentally created by the individual.

This group identification has been shown to help individuals infer characteristics of others by retrieving information on the group (Fiske & Taylor, 2013). This can mean that the individual characteristics of the person being mentally grouped and categorized are

overridden by the mental categorization. These biases can be further highlighted by the social identity which creates an emotional connection with the ingroup and thus amplifies perceptual distortion and biases (Dovidio & Gaertner, 2010).

The outgroup/ingroup distinction also creates intergroup competition (Tajfel & Turner, 1997), which could eventually be linked to discriminatory behaviors. Additionally, social categorization can initiate cognitive biases that lead to prejudice and stereotyping (Dovidio & Gaertner, 2010). Thus, this perspective goes against personality and individual characteristics as the sources of stigma and instead places the focus on social identity and group identification. This perspective allows for social and contextual characteristics to be taken into account, while not stepping entirely away from individual processes.

1.2.3. Social experience, social influence, and functional relations between groups.

The third perspective relies on personal experiences with other groups, the social influence regulating the interactions, and the overall relationships between groups to explain stigma and attitudes between said groups (Dovidio et al., 2005). Within this perspective, intergroup contact is a predictor of attitudes with negative experiences predicting negative attitudes (Hayward, Tropp, Hornsey, & Barlow, 2017) and positive experiences predicting positive attitudes (Dovidio, Love, Schellhaas, & Hewstone, 2017). This perspective gives a formative attribute to intergroup experiences in which they inform future interactions. Moreover, these attitudes can be passed on to others in the form of social norms as in the case of parental influence (Degner & Dalege, 2013) or peer alignment (Sinclair, Lowery, Hardin, & Colangelo, 2005). Finally, when there is a functional relation between groups, which is to say, interactions carried out to fulfil a purpose (i.e., competition, collaboration, etc.), the emergence of negative attitudes and stereotypes tends to occur (Dovidio et al., 2005).

1.3. The Dual-Representation of Stigma

Additionally, stigma has been hypothesized to exist along two dimensions by dual-process theories. These theories aim to understand how individuals receive outside information (input) and respond to it (output) by highlighting dichotomic systems (Sherman, Gawronski, & Trope, 2014). The processes have been distinguished as spontaneous versus deliberate (Fazio, 1990), automatic versus controlled (Schneider & Shiffrin, 1977), and impulsive versus reflective (Strack & Deutsch, 2004), among others.

A variety of models exist explaining the way in which attitudes function (Brewer, 1998; Devine, 1989; Fiske & Neuberg, 1990; Greenwald & Banaji, 1995; Pryor, Reeder, Yeadon, & Hesson-McInnis, 2004; Wilson, Lindsey, & Schooler, 2000). They differ, however, in the theoretical constructs they propose to explain these phenomena and in whether or not they refer to dual-processes, dual-representations, or dual-systems (Sherman et al., 2014).

Dual process theories propose the existence of two pathways that are functionally distinct but reflect a single representation (Sherman et al., 2014). For example, the Continuum of Impression Formation model (Fiske & Neuberg, 1990) aims to understand how individuals form impressions of others (single representation) through a continuum that has two processes at each end (dual-process). It assumes that the closer the impression formation is to category-based processes, the more prone it is to rely on stereotypes, while the closer it is to individual-processes, the more likely it is to rely on the individual's particular attributes. Dual-process theories will be further addressed in chapter two to look at the relationship between stigma representations and behaviors.

Dual-representation models, on the other hand, assume two different representations with distinct behavioral outcomes. Devine's model of stereotyping (Devine, 1989) for example, assumes that individuals acquire stereotypes from social context (other people, the

media, etc.) and automatically activate them when encountering someone from the stigma-receiving group (implicit). Individuals can, however, override this automatic association by accessing more favorable personal beliefs about the group (explicit). Thus, they are representing two distinct forms of stigma using a single process.

Finally, dual-system theories make assumptions regarding both process and representation, and state that different outcomes are the product of two functionally distinct processing systems.

Research on stigma has focused on dual-representation theories and has expanded on Devine's model (1989). One of the most important examples is Greenwald and Banaji's model (1995), which highlights how stigmatized groups have been associated with negative traits (i.e., fat/bad, fat/lazy). They define implicit stereotypes as "the introspectively unidentified (or inaccurately identified) traces of past experience that mediate attributions of qualities to members of a social category" (Greenwald & Banaji, 1995, p.15). This definition implies a recall of past experiences with a group member, for example, as a predictor of the attributions made about that group or individuals belonging to it. This attribution lays outside of the individual's control and are thus reflective of an uncontrollable (although not necessarily unchanging) form of bias.

Wilson et al. (2000) expands on this by proposing that the misidentified traces of past experiences can be due to a change in explicit bias. They argue that when an explicit attitude is changed, the previous one can remain in an implicit manner. This means that, while a conscious and explicit attitude towards a group of individuals has been changed, a second, different and implicit attitude can remain and have an influence over people's responses. For example, an individual might receive anti-bias training, which influences his explicit attitudes towards higher weight individuals, making it so that he now understands that obesity is not caused by laziness but by an array of different interacting factors. However, an implicit

negative attitude might still remain and negatively influence his responses to higher weight individuals. Social desirability (Fisher, 1993) could potentially make it so that an individual with negative views towards a group does not externalize them explicitly, but does so in an implicit manner. This differs from previous explanation of implicit attitudes by stating that behaviors are not memory stored evaluations or construction views by assigning each of them a mechanism of action and a specific situation in which they can occur (Wilson et al., 2000). In other words, it is not that responses to a stimulus are based on just previous responses that have been memorized, but a reminiscence of previous attitudes towards that stimulus.

A further expansion on implicit stigma implies that both implicit and explicit attitudes influence one another and can have effects on behavior (Bertram Gawronski & Bodenhausen, 2007). This means that changes in explicit stigma can serve as a means to override implicit stigma, or at least modify the reactions caused by it.

1.4. Weight Stigma

This thesis will focus on the characterization of obese individuals, which is commonly referred to as weight stigma and defined as "the pervasive social devaluation and denigration of people who are perceived to carry excess weight" (Major, Tomiyama, & Hunger, 2018). It will do so using both implicit and explicit representations of stigma (Wilson et al., 2000). In the next section of this chapter the content of stigma in both explicit and implicit forms will be explored.

1.4.1. Content of weight stigma.

Different conceptualizations of weight stigma have been explored for both implicit and explicit stigma, each one with slightly different contents and implications. The following sections explore their nuances.

1.4.1.1. Content of explicit stigma.

One of the first mentions of widespread discrimination towards obesity was made by Allon (1979) via qualitative descriptions of experiences of living with obesity among obese individuals. One of the first effort to quantify this explicit weight stigma in perceivers (as opposed to targets of stigma) was done by Allison, Basile, and Yuker (1991). It explored weight stigma by using two dimensions: attitudes and beliefs, both referring to stigma as an association of negative attributes (i.e., low self-esteem and social difficulties) with the concept of obesity. They did so by using two specially designed scales, the Attitudes Towards Obese Persons scale (ATOP) and Beliefs About Obese Persons scale (BAOP). In their study a sample composed by the National Association to Advance Fat Acceptance (NAAFA), a sample of graduate students and a sample of undergraduate students was assessed and compared. The different populations are important because while the people belonging to the association would have positive attitudes towards obese individuals, the students were expected to have a more neutral outlook. Results confirm this hypothesis.

Their results yielded three distinctive factors in the functioning of weight stigmatizing attitudes within the ATOP. First "Different personality" which refers to the attribution of different personality characteristics of people who are obese (i.e., Severely obese people are usually untidy); The second factor, "Social Difficulties", refers to the perception that people with obesity have social problems (i.e., Obese people should not expect to lead normal lives.), and the third factor "Self-Esteem", refers to how people who are fat perceive themselves (i.e., Most obese people feel that they are not as good as other people).

The ATOP classification makes the person reflect on his or her own beliefs about personality traits of obese people. These attitudes, however, even though negative, might not have a direct link to stigmatizing attitudes because they focus on traits of the individual which might not be seen as controllable. The BAOP has a more direct link toward beliefs of

controllability (i.e., Obesity is usually caused by overeating), which could therefore be more closely associated with discriminatory behaviors (Allison et al., 1991).

The conceptualization of bias in both scales developed by Allison et al. (1991) are adequate to evaluate perceived differences in the personality of obese individuals without necessarily highlighting the ideology of the subject answering the questionnaire. Most measured attitudes are not related to willpower or self-reliance and instead focus on the general concept of obesity or generic negative attributes.

In samples composed of individuals of varying weights high scores in these scales have been associated with stigma consciousness, low body esteem, and higher perceived barriers to healthy eating (Schmalz & Colistra, 2016). These results highlight the focus on the generic negative attributes of obesity, since they seem to serve as a proxy for internalization of bias. Males, younger respondents, and more frequent exercisers have also been shown to score higher on these scales (Flint, Hudson, & Lavallee, 2015).

1.4.1.2. Weight Stigma as a pathological fear of the concept of fatness

Robinson, Bacon, and O'reilly (1993) approach weight stigma in a different, more conceptual manner. They defined fat-phobia as a pathological fear of the concept of fatness, meaning that stigma is not specifically directed towards individuals, per-se, but towards fatness as a construct. In their study a mostly female sample (974 females and 117 males) answered the 50-item questionnaire along with some general questions about themselves. They found that average weight, younger, and with higher education individuals are more likely to show fat-phobic attitudes. The factor analysis showed six factors relevant to the scale: 1. Undisciplined/ inactive/unappealing (i.e., Lazy/industrious), 2. Emotional/psychological problems (i.e., insecure/secure), 3. Grouchy/unfriendly (i.e., unfriendly/friendly), 4. Poor hygiene (i.e., smells bad/smells good), 5. Passivity (i.e., weak/strong), 6. Stupid/uncreative (i.e., stupid/smart).

It is worth mentioning, however, that the sample used to validate this measure was obtained from students attending lectures on body image, psychotherapy patients with negative body image, and from weight loss groups (Robinson et al., 1993), thus, clearly biasing the results towards a more self-directed view of stigma rather than as an external onlooker. The gender disparities within the sample might also have a biasing effect on the results. A shorter 14-item form of the scale that takes only the first factor into account was created with good reliability in both the old and new samples (Bacon, Scheltema, & Robinson, 2001). However, the same populations were used. So far only a German validation of the scale has been done using a random sample (Stein et al., 2014) and in their study only small relationships were observed between fat-phobia scores and perceived devaluation and discrimination, while social distance was not related to higher fat-phobic attitudes.

Thus, this conceptualization implies a personal valorization of the concept of fatness and a fear of belonging to a stigmatized group. Whether it is because of the associated negative social-identity or because of the perceived health consequences is not established in the scale or conceptualization.

Professionals who are younger, and lower in weight seem to score higher in this scale (Panza et al., 2018). Results seem to be highly uniform among certain professionals, with high scores of fat phobia in physical therapists (Awotidebe & Phillips, 2009), dietitians (Jung, Luck-Sikorski, Wiemers, & Riedel-Heller, 2015), and exercise professionals (Panza et al., 2018). This could potentially be because of the negative perceived health consequences, but it is, as previously stated, unclear.

1.4.1.3. Weight Stigma as a blame ideology

Finally, Crandall (1994) developed the anti-fat attitudes questionnaire under the assumption that weight bias is part of a blame ideology in which values and beliefs about the stigmatized group are associated with their rejection. There is also a clear antipathy towards

the group, and lack of self-interest in that antipathy. This allowed him to divide stigmatizing attitudes in three main categories: willpower or the belief that obese people are in that condition because they lack the ability to control themselves; dislike, which describes a general dislike for the higher weight individual; and fear of fat, which is a fear of becoming a higher weight individual. The scale is composed of 13 items from diverse topics like personal relevance, willingness to interact with obese people, and beliefs about the etiology of obesity.

In the article that reports the process and results of the validation of the anti-fat attitudes questionnaire, Crandall (1994) carried out three studies: one for development of the scale and filtering of items, another for framing the anti-fat attitudes in an ideological system, and a third to distinguish between participants with political differences. All of the studies, however, drew their samples from psychology classes, which skews the results towards a younger population with interests in psychological phenomena, possibly biasing the results.

Crandall (1994) describes anti-fat attitudes as a parallel of other forms of stigma like symbolic racism within three main commonalities: 1. the association between values, beliefs, and the rejection of a stigmatized group, 2. antipathy toward deviance, and 3. the lack of self-interest in out-group antipathy. In his studies he tested this by comparing racist attitudes to anti-fat attitudes and found parallels in all three areas. He also found no in-group bias and less social desirability than in racism.

This conceptualization of weight stigma might, however, imply that there are consistent ideological and socially enforced determinants to weight bias. This would imply cultural differences, which have previously been confirmed by Crandall et al. (2001), but has failed to be reproduced by others (Alameda & Whitehead, 2015; García Sandoval, Caracuel, Cocca, Cocca, & Ceballos Gurrola, 2017; Puhl et al., 2015).

Responding to the limitations of previous works, Lewis et al. (1997) created the anti-fat attitudes test (AFAT), arguing that the distinction between self-referential fat and social attitudes towards persons who are fat were not clearly established in previous questionnaires.

In the paper that is meant to validate the scale, Lewis et al. (1997) ran two studies. The first one was composed by 285 college students with different majors and coming from different ethnicities. Out of the 54 initial items, 47 were chosen for the final scale and were divided into three factors that were not correlated to social desirability: Social/Character disparagement (i.e., If fat people don't get hired, it is their own fault), physical/romantic unattractiveness (i.e., I can't believe someone of average weight would marry a fat person), and weight/control blame (i.e., Most fat people will latch on to almost any excuse for being fat). These factors mirror previously proposed divisions of anti-fat bias but are widely distinct in the wording of the questions since it divides the focus in widely accepted social beliefs and self-referential ones. This is done in order to distinguish the individual's own beliefs about its personal weight in contrast with his or her beliefs of other people.

The second study of the same validation paper found that exposing the participants to behavioral vs. biogenetic information led to significant differences in the blaming of persons for their body size.

Higher scores in these scales have been found to be related to body dissatisfaction (Tremblay et al., 2016), and lower expectations towards obese children (Greenleaf & Weiller, 2005). Scores seem to be higher among physical education students (Panza et al., 2018).

1.4.1.4. Conclusions to explicit stigma conceptualizations

Overall, there is a variety of conceptualizations of explicit stigma with different forms of evaluation, benefits, and problems of their own. It is important to acknowledge, however, that the measurement of explicit negative beliefs or opinions towards a specific population by means of direct questioning will always be subject to a measure of self-control and social

desirability (Fisher, 1993). Differences how individuals perceive others, the concept of obesity, or their own weight can also be unconscious. This is to say that there might be stigmatizing reactions and associations that are not under the control of the individual since he might not be aware of them. Implicit forms of evaluation were developed for this specific reason and will be addressed now.

1.4.2. Implicit Weight Stigma

Implicit stigma has been described as beliefs that people hold in a deeply ingrained level. People may be unwilling to be openly reveal their stigma because of social norms (Crandall, Eshleman, & O'Brien, 2002) or may even be unaware of these beliefs, and thus are not really sensitive to questionnaire-based evaluations (Brewis & Wutich, 2012). Implicit stigma may present itself in subtle behaviors such as body language or indirect assumptions based on stereotypes. For example, implicit associations of stigma might predict how close someone chooses to sit to an obese person (Bessenoff & Sherman, 2000).

The Implicit Association Test (IAT) has been widely used for the evaluation of implicit attitudes towards different populations, specifically in the stigma context (Greenwald, McGhee, & Schwartz, 1998). It has also been prominently used in the assessment of implicit anti-fat attitudes (Brewis & Wutich, 2012; Teachman & Brownell, 2001; Teachman, Gapinski, Brownell, Rawlins, & Jeyaram, 2003). The test asks participants to categorize stimuli related to two target concepts and two attributes (e.g., the target concepts Fat and Thin are paired with the attributes Bad and Good) as fast as they can. The faster the pairings, the stronger the association of the concept to the attribute in memory, and vice versa.

One of the reasons for the popularity of the IAT among stigma researchers is that it does not only demonstrate the existence of anti-fat or pro-thin bias, but also how these stereotypes affect subsequent judgments. There are differences between the associations of

fat to lazy and from fat to bad, with the fat/lazy association being more closely related to explicit forms of bias (Teachman & Brownell, 2001). This might have to do with the salience of the lazy stereotype held against higher weight people as compared to the less socially acceptable one of them being bad.

It is important to note, however, that even though the contents of implicit and explicit stigma are overtly negative, we have not discussed their effect on discriminatory behaviors. The next chapter aims to answer how weight stigma affects the reactions towards the stigmatized group, both conceptually and practicall

Chapter 2: How Weight Stigma Affects Perceiver's Behaviors

A variety of models have been proposed to explain how the perceiver's behaviors are affected by stigma towards different groups. Among the most important ones are the integrated behavioral and stereotype content model framework (Cuddy, Fiske, & Glick, 2007; Fiske, Cuddy, Glick, & Xu, 2002) and an array of dual-process models that differentiate individuals reactions to stigma as automatic or controlled (Pryor et al., 2004; Sherman et al., 2014; Strack & Deutsch, 2004). Both the BIAS map and the dual-process models will be explored in this chapter.

2.1. The integrated behavioral and stereotype content model framework

The integrated behavioral and stereotype content model framework started out as the stereotype content model (Fiske et al., 2002), which was later expanded with the intergroup affect and stereotypes (BIAS) map (Cuddy et al., 2007).

2.1.1. The stereotype content model

In order to understand how the integrated behavioral and stereotype content model works it is first important to understand how it conceptualizes stigma within the stereotype content model. The stereotype content model aims to identify systematic patterns in the content of different stereotypes (Fiske et al., 2002). The model rests on four main hypotheses: (1) the primary dimensions of stereotypes are competence and warmth; (2) both dimensions range from low to high, and stereotypes depend on the combination of those dimensions (i.e., high competence and low warmth could describe anti-Semitism); (3) emotions like pity, envy, admiration and contempt result from the different competence-warmth combinations.

Within this model, overweight individuals would be regarded as having low competence (i.e., low self-esteem, lack of willpower, unintelligent, as presented in the previous chapter), and also low warmth because of the perceived antipathy (Kervyn, Fiske, & Yzerbyt, 2015). Higher weight individuals then fall into the low competence/low warmth

quadrant. Figure 2 shows the quadrants of the stereotype content model (Fiske, Cuddy, Glick, & Xu, 2002).

		Competence	
		Low	High
Warmth	High	**Paternalistic stereotype** low status, not competitive (e.g., housewives, elderly people, disabled people)	**Admiration** high status, not competitive (e.g., ingroup, close allies)
	Low	**Contemptuous stereotype** low status, competitive (e.g., welfare recipients, poor people)	**Envious stereotype** high status, competitive (e.g., Asians, Jews, rich people, feminists)

Figure 2. Stereotype content model adapted from Fiske et al. (2002): Four types of stereotypes resulting from combinations of perceived warmth and competence.

2.1.2. Behaviors from intergroup affect and stereotypes (BIAS) map.

This model was further expanded by linking intergroup context (i.e., facilitation/harm), to the development of stereotypes, which then provoke affect, and finally lead to discriminatory behaviors in what is known as the Behaviors from Intergroup Affect and Stereotypes (BIAS) map (Cuddy et al., 2007). This model predicts that stereotypes characterized by warmth are related to an increase in active behavioral tendencies, specifically reduced active harm and enhanced active facilitation. Competence stereotypes on the other hand are related to passive behaviors like reduced passive harm and increased

passive facilitation. It follows then, that groups that are perceived to be both warm and competent elicit facilitation tendencies, while groups that are not perceived as warm or competent elicit harmful tendencies. For the BIAS map, emotions are the main predictors of behavioral tendencies, but stereotypes are the ones that prompt these emotions.

The addition of the BIAS map to the stereotype content model is referred to as the integrated behavioral and stereotype content model. In it four types of behaviors are added to the warmth/competence scale. Figure 3 shows all the reactions based on different levels of warmth and competence.

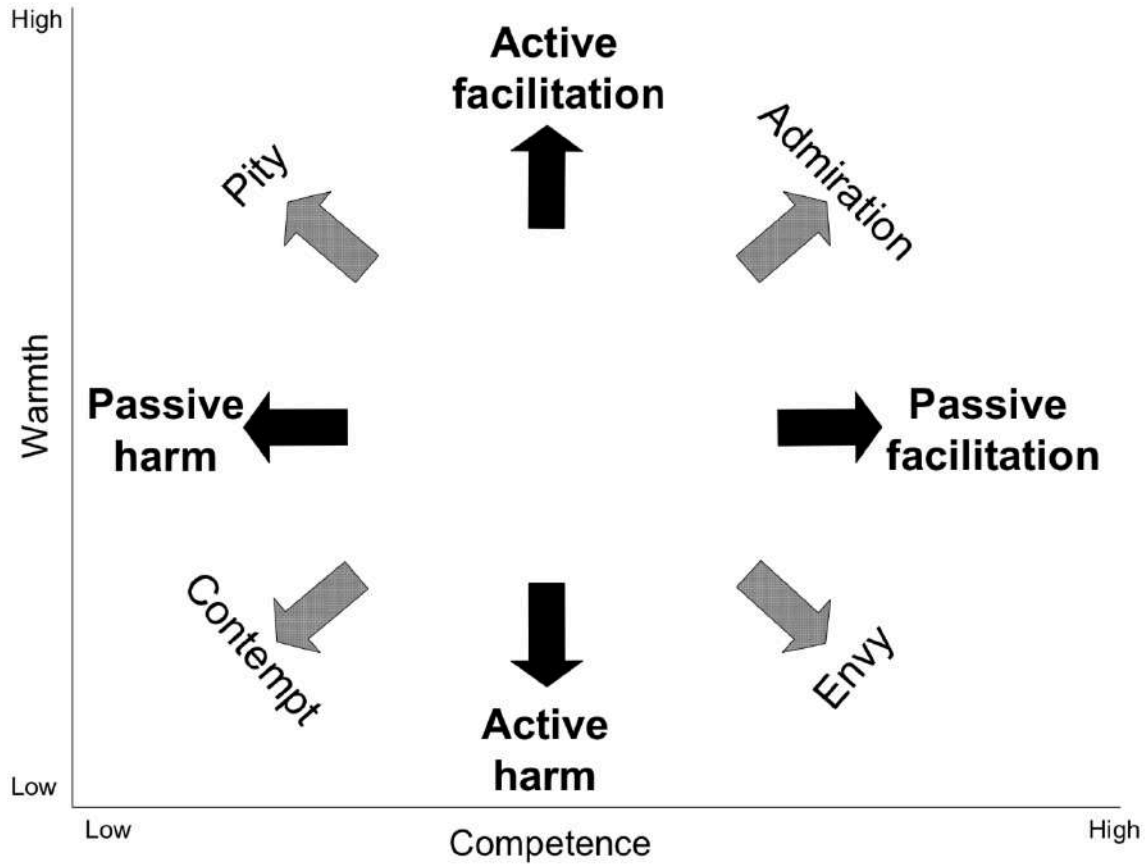


Figure 3. Integrated behavioral and stereotype content model (Cuddy et al., 2007): Four types of behavior resulting from four types of stereotypes based on warmth and competence.

The integrated behavioral model is theoretically sound for predicting behaviors under the control of the perceiver but does not take into account automatic or reflexive responses.

This is especially relevant for stigma research because there is a dual-representation of stigma (explicit/implicit) which could lead to dual-process responses.

2.2. Dual-Process Models of Stigma

In chapter one, we established that weight stigma can be analyzed in a dual-representation manner (explicit/implicit). Based on the previous section that representation has the potential for different conscious reactions based on competence and warmth. The present section will focus on the idea that there are covariations of dualities, meaning that variance in one duality (explicit/implicit) can result in a variation in another duality (automatic/controlled; Gawronski, Sherman, & Trope, 2014).

Different dualities have been proposed for the analyses of mental processes such as Automatic/Nonautomatic, Associative/Rule-Based, Perceptual/Conceptual, Associative/Propositional (Moors, 2014). Each one of these dualities carries theoretical and practical implications of their own. The strongest dual-process theories must have three important characteristics: (1) the duality must be conceptually independent from one another, (2) methods should exist to establish a process as belonging to one part of the duality or the other, and (3) no overlap must exist in the operationalization of these dualities (Moors, 2014).

The automatic/non-automatic approach is the most general dichotomy that conceptually encompasses others. The automatic process is used to refer to a wide variety of other terms like uncontrolled, unintentional, unconscious, efficient, and fast (Moors & De Houwer, 2006). In this approach, conceptual independence is a given simply because of the antonymous nature of the wording. The methods for categorizing the action are conditional to the efficacy and time of the process (Moors & De Houwer, 2006). If it operates under low attentional resources and under the minimal time, it is automatic. A problem that has been observed with this proposition is the generality of the use of dichotomies used to describe the

psychological phenomena. Meaning that at least conceptually, any two antonyms could be used to construct a dual-process model.

A second duality was proposed by Strack and Deutsch (2004). They make use of the associative and rule-based duality by operationalizing it as a reflective-impulsive dichotomy. Their model proposes a reflective system that generates behavioral responses based on knowledge and values, as well as an impulsive system that generates responses through associative links. For example, when and individual is presented with stimulus A, her response might be associative, (which is to say it *conforms* to previously existing rules about stimulus A), or rule-based (which means that it *follows* previously existing rules).

Conforming to a rule means that the input-output relation is summarized in a previously existing association, while rule following means that the rule needs processing in order to produce a response (Smith, Langston, & Nisbett, 1992). Simply put, associative/rule-based models are based on the idea of if-then. If an input happens, then (a) an association with past experiences will determine the outcome, or (b) a processing of existing rules will determine the outcome.

The careful reader will note that in both previously mentioned models there is an operational overlap that creates problems when categorizing behaviors. Non-automatic responses, for example, can be fast and efficient due to previous experience while still requiring reasoning, while rule-based systems might be helped by associative information. This is why researchers have suggested a less categorical approach to dual-process response research (Moors, 2014, p. 20-34; Sherman et al., 2014). The alternative is a gradual approach in which input A cannot only elicit a quick efficient response, but also a second response after rule-based analysis.

Such a model has actually been proposed within the context of stigma related responses. Pryor et al. (2004) stated that reflective behaviors towards stigmatized groups

were rule-based, and dependent on social norms, as well as allowing for the possibility to interact with reflexive responses. In their model, the reactions are time dependent (see Figure 4), with the reflexive response acting first as an initial reaction and the rule-based reaction acting as adjustments (Pryor et al., 2004). The reflexive process is emotionally driven and based on automatic associations. It produces uncontrollable approach/avoidance reaction in the presence of stimuli.

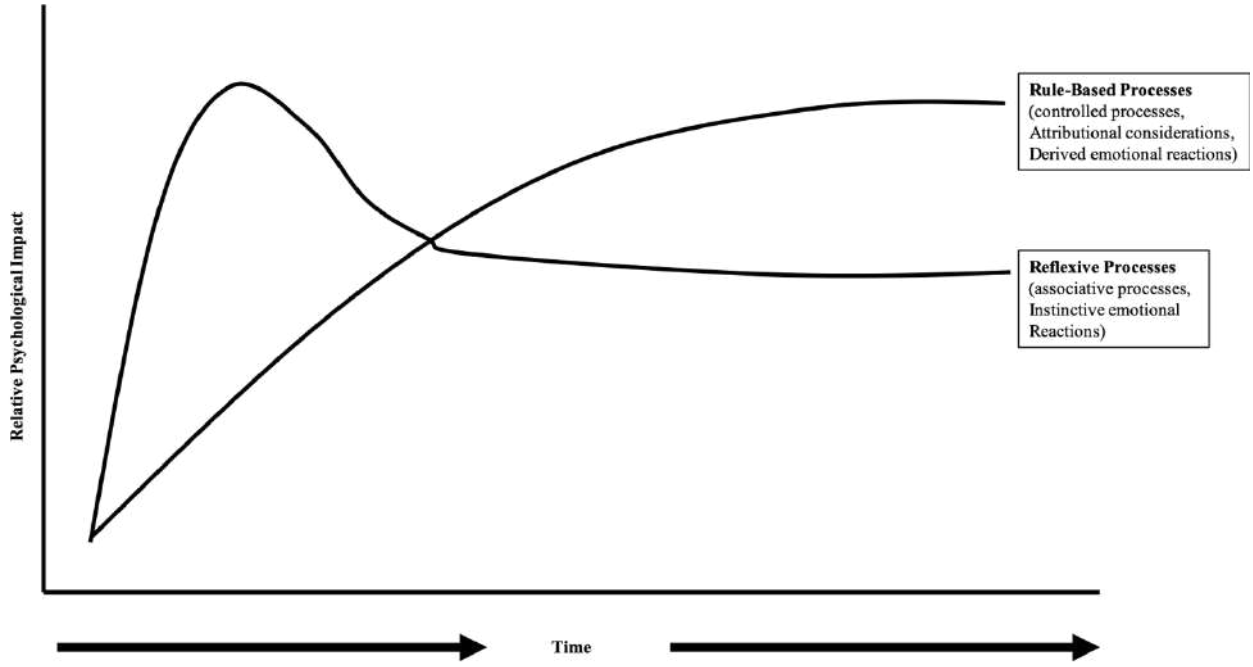


Figure 4. The reflexive/rule-based model of reactions to perceived stigma. Adapted from Pryor et al. (2004).

Stigmatizing attitudes in any population can be associated with responses towards the stigmatized group. Specifically, research has shown that negative attitudes towards a stimulus can lead to avoidance tendencies, while positive attitudes lead to approach ones (Chen & Bargh, 1999). For example, a previous study showed that people with higher disgust sensitivity were faster to avoid people in stigmatized groups, especially when they perceived a higher controllability of their stigmatizing category (i.e., obese and does not exercise vs. obese with a glandular disease; Pryor, Reeder, Yeadon, & Hesson-McInnis, 2004).

It is thus expected that in the case of stigmatizing attitudes, explicit stigma about higher weight individuals affects ruled-based processes, while implicit stigma affects reflexive, approach/avoidance responses. As for the direction of these relationships, they could both be positive (i.e., implicit stigma results in higher rule-based responses), or compensatory behaviors could emerge. In examples in other forms of stigma, like homophobia, there seems to be a compensatory behavior expressed as an impulse approach tendency to homosexual content (Cheval et al., 2016). This could indicate, that at least at an impulsive level, individuals with high stigmatizing attitudes could have a tendency to approach higher weight individuals. No study has yet explored the approach/avoidance tendencies of exercise science students, or of any population related to explicit weight stigmatizing attitudes.

2.3. Weight Stigma's Effect on Behaviors

Implicit and explicit stigmatizing attitudes could be related to weight stigmatizing behavior. This is especially relevant given that previous research has shown that higher weight individuals are likely to avoid exercise because of fear of stigmatization like being ridiculed or stared or laughed at (Lewis, 2011; Vartanian & Novak, 2011).

The relationship between stigmatizing attitudes and stigmatizing behaviors is actually an ongoing debate in the scientific literature for stigma. McConnell and Leibold (2001) were among the first ones to experimentally test the predictive properties of implicit bias as measured by the implicit association test (IAT) over racial bias by assessing social interactions with white and black experimenters. Their results showed that higher negative implicit attitudes (desirable and undesirable) were related to both negative interactions and higher levels of explicit stigma. Ziegert and Hanges (2005) showed similar results when testing the effect of the implicit bias level of recruiters and their hiring decisions. They found

that explicit bias did not predict a reduction in the likelihood of hiring a black candidate (as opposed to a white one), but implicit bias did.

These results, however, have been put into question, since the scores did not permit the prediction of individual-level behaviors and inter-rater reliability (Blanton et al., 2009). When re-analyzing the same data, different statistical specifications and/or removing specific outliers made the results insignificant. While there is some evidence that the IAT scores actually serve as predictors of discriminatory behavior (Greenwald, Poehlman, Uhlmann, & Banaji, 2009) there is still a large number of studies that have not found that relationship (Blanton & Jaccard, 2015; Blanton, Jaccard, Strauts, Mitchell, & Tetlock, 2015; Carlsson & Agerström, 2016; Dehon et al., 2017; Fiedler, Messner, & Bluemke, 2006; Oswald, Mitchell, Blanton, Jaccard, & Tetlock, 2013). It can thus be concluded that the influence of implicit and explicit stigma over specific discriminatory behaviors needs further research.

Little research has been conducted on the relationship between explicit weight stigmatizing attitudes and discriminatory behaviors, and more specifically, none has looked at the explicit-conscious, implicit-automatic relationships. However, one previous study found a relationship between disgust sensitivity and avoidance of pictures of higher weight individuals, especially those deemed to have higher controllability over their condition (Pryor et al., 2004). Additionally, distinctions between active/passive facilitation/harm have not been made in weight stigma specifically.

Chapter 3: How do Targets of Discrimination Respond to Stigma?

Examining the effects of stigma may help us to understand how individuals process and respond to it. This chapter will focus on how individuals with obesity process stigma. It will describe current research that focuses on higher weight individuals and the way they perceive and are affected by stigma. Close attention will be paid to the separated means in which weight stigma processes have been studied until now and their effects on the individual. In order to do so, the most common processes will be described one by one. First, perceived discrimination, followed by weight stigma concerns, and finally weight stigma internalization.

3.2. Weight Stigma Processes

3.2.1. Perceived discrimination.

The first of the weight stigma processes to be analyzed is perceived discrimination. Defined as the experiences of higher weight individuals with behaviors or policies that emanate from bias toward stigmatized groups (Major, Tomiyama, & Hunger, 2018), perceived discrimination is the quintessential measure for the experience of stigma.

In the case of weight stigma there is a large body of literature indicating perceived discrimination towards higher weight individuals in life domains like education (i.e., Karnehed, Rasmussen, Hemmingsson, & Tynelius, 2006), employment (i.e., Puhl & Brownell, 2001), health care (i.e., Hebl & Xu, 2001), interpersonal relationships (Sheets & Ajmere, 2005), and the media coverage (i.e., Eisenberg, Carlson-McGuire, Gollust, & Neumark-Sztainer, 2015).

The external forms of stigma that are encompassed in perceived discrimination might have detrimental effects on health outcomes. Previous findings show that weight-based teasing in adolescence predicted binge eating and unhealthy weight control 15 years later (Puhl, Wall, Chen, Austin, Eisenberg & Neumark-Sztainer, 2017). The experience of stigma

has also been positively associated with motivation to avoid exercise (Vartanian & Novak, 2011), as well as increased stress (i.e., Hatzenbuehler, Keyes, & Hasin, 2009), increased sedentarism (Jackson & Steptoe, 2017) and increased risk of mortality (Sutin, Stephan, & Terracciano, 2015).

Cultural exposure to negative responses to higher weight bodies can create an awareness on individuals about their own bodies. This exposure can normalize the idea that 'fat is bad' (Cramer & Steinwert, 1998) creating a more socially consistent negative attitude towards obese individuals. Another possibility is that in cultures with a higher prevalence of obesity there is an underestimation of weight categories because of a normalization of higher weight bodies (Robinson, 2017). The way in which these normalization processes affect the perception of discrimination remains to be studied and compared cross-culturally.

3.2.2. Weight stigma concerns.

There is evidence to suggest that perceived discrimination is related to an increase in weight stigma concerns (Hunger, Major, Blodorn, & Miller, 2015; Major, Eliezer, & Rieck, 2012). Weight stigma concerns has been defined as a state in which individuals anticipate discriminatory responses against themselves based on their social identity, in this case as higher weight individuals (Major et al., 2018). This means that the acknowledgement of the existence of and experience with stereotypes makes a person concerned about possible future encounters with this sort of discrimination.

Importantly, however, this definition implies that there must be an identification with the social group (i.e., being a higher weight individual) in order to anticipate stigma. Previous studies have corroborated this by showing, for example, that exposure to weight-stigmatizing media caused an increase in calorie consumption in only self-perceived overweight women (Major, Hunger, Bunyan, & Miller, 2014). This has important repercussions since it might not be the actual physical weight that makes people anticipate stigma, but the perceptions of

their own weight, as well as the affiliation to the social identity of being a higher weight individual. This situation, as previously mentioned, can depend on exposure to higher weight individual and cultural differences (Cramer & Steinwert, 1998; Robinson, 2017).

The creation of this construct comes from the need to distinguish the heterogeneity of stigma responses between stereotyped individuals. Pinel (1999) developed a general *'stigma consciousness scale'* to do just that. She found that individuals with high consciousness of the stigmatization that their group is subjected seldomly contradict stereotypes about their group, thus possibly allowing for the stereotypical idea of their group to continue to exist. Based on this scale a weight stigma-specific scale was developed (Hunger & Major, 2015). Weight stigma concerns have been shown to mediate the relationship between BMI and self-perceived weight (Hunger & Major, 2015). Weight stigma concerns are also associated with maladaptive responses including physiological stress, decreased self-regulation abilities, and increased motivation to avoid stigmatizing settings (e.g., the gym) and to escape stigma by engaging in unhealthy weight loss behaviors (Hunger, Major, Blodorn, & Miller, 2015).

3.2.3. Weight bias internalization.

Higher weight individuals might not only be subject to and expect stigmatization, they might also endorse some of the negative attitudes associated with stigma showing levels of both implicit and explicit anti-fat attitudes (Brochu & Esses, 2011; Schwartz, Vartanian, Nosek, & Brownell, 2006). In their study, Schwartz et al. (2006) found that the strength of stigma decreases as the respondents weight increases. This reduction, however, does not entirely eliminate stigma in higher weight respondents since significant levels of stigma are still perceivable among the individuals with the highest BMI. The measure used to assess stigma revealed that the associations between fat and bad, and fat and lazy were still prevalent in higher weight individuals. When paired as lazy/anxious, higher and regular weight individuals exhibited equally strong implicit stereotyping. These attitudes tend to be

dependent on labels and social associations between the words and attributes being measured, with participants assessing higher weight individuals in a more negative manner when referred to as overweight than as fat (Brochu & Esses, 2011).

Two scales have been developed for the measurement of weight stigma internalization: The Weight Bias Internalization Scale (WBIS; Durso & Latner, 2008) and the Weight Self- Stigma Questionnaire (WSSQ; Lillis, Luoma, Levin, & Hayes, 2010).

The WBIS is an 11-item scale that was developed in a study that recruited mainly women (*female* = 164, *male* = 34) (Durso & Latner, 2008). Only individuals with a BMI over 25 were accepted in the study. The WBIS was tested along with the Anti-fat Attitudes Questionnaire (AAQ) and measures of self-esteem, body image, mood disturbance, drive for thinness, and binge eating. In their study, internal reliability was confirmed by using Cronbach's alpha and a confirmatory factor analysis was then run to make sure the single factor hypothesis was correct. The small sample size and mixed results make it difficult to confirm that there is indeed a single factor that can explain the whole variance. Weight bias internalization was nevertheless significantly correlated to anti-fat attitudes without completely overlapping with the construct, providing theoretical evidence for the existence of weight stigma internalization. Scoring highly on measures of internalized weight stigma also correlated with poorer psychological well-being and disordered eating symptomology (Durso & Latner, 2008).

In an attempt to capture the possible multidimensionality of internalized weight bias Lillis et al. (2010) created the WSSQ. The study has an equally small sample (n = 169) and is composed of 12 items over two distinct subscales—self-devaluation and fear of perceived discrimination. This scale thus overlaps, at least theoretically, with the perceived discrimination scales that have been previously discussed.

The effects of weight bias internalization on health have been thoroughly documented over the last couple of years (Pearl & Puhl, 2018). First off, the relationship between weight stigma internalization and body-mass index is not consistent in the literature with studies both finding a relationship (Carels et al., 2010; Palmeira, Pinto-Gouveia, & Cunha, 2016; Puhl, Himmelstein, & Quinn, 2018), and not finding it (Durso & Latner, 2008; Lillis, Thomas, Levin, & Wing, 2017; Vartanian, Pinkus, & Smyth, 2018). Higher weights however, appear to be associated with higher weight stigma internalization when a broad range of body weights are represented (Pearl & Puhl, 2018). This supports previous findings linking stigma measures to perceived weight and not physical weight, making self-perception the most important variable to measure.

The relationship between motivation to engage in physical activity and weight stigma internalization, however, is clearer. While not all studies have found a direct relationship between physical activity and internalization of stigma (Koball et al., 2018; Schvey et al., 2016), there is strong evidence to support its relationship with motivational factors that predict physical activity (Mensinger & Meadows, 2017; Vartanian et al., 2018; Vartanian & Shaprow, 2008). These results point to a mediated relationship between motivational variables and direct health behaviors or behaviors that could indirectly improve health.

An example of the indirect effects weight bias internalization can have on individuals is the relationship between physical activity motivation, physical activity, and depression. Exercise has been documented to have positive effects on the clinically depressed (Craft & Perna, 2004). The practice of physical activity can be hindered not only by weight stigma attitudes from people associated with exercise (Dimmock, Hallett, & Grove, 2009; Robertson & Vohora, 2008), but also by the internalization of those attitudes by the individual. This results in an indirect increase of depressive symptoms because of the impediments placed on a shielding behavior.

Internalized weight stigma does not only affect mental health indirectly. There is fairly conclusive evidence that attests to the relationship between weight stigma internalization and depressive symptomatology (Pearl & Puhl, 2018). As for anxiety, several studies have found that there is a positive relationship (Durso & Latner, 2008; Lillis et al., 2017). Weight bias internalization has also been associated with lowered self-esteem, distorted body image, binge eating, and other eating pathologies (Pearl & Puhl, 2018).

This suggests that weight bias internalization is related to specific and negative mental and physical health outcomes. The functioning of internalization in conjunction with other stigma processes like perceived discrimination and weight stigma concerns has remained in question.

3.1. Self-Control and Exercise Avoidance

3.1.1. Self-control.

In order to understand why stigmatization might motivate weight loss, as proposed by Callahan (2013), or discourage health behaviors, the concept of self-control needs to be explained.

Self-control has been thoroughly examined through different lenses, which has resulted in a variety of definitions, and related concepts that enrich it's study by clarifying the mechanisms involved in this construct (Duckworth & Kern, 2011).

Self-control can be conceptualized as an inhibitory capacity, this is to say, the ability to inhibit impulses that would yield immediate gratification to obtain a larger reward later (Mischel, Shoda, & Rodriguez, 1989). Some models propose that this capacity is expressed as limited self-control resources, which can be depleted by exerting self-control to inhibit responses, this phenomenon is known as ego depletion (Baumeister, 2002).

Self-control has been conceptualized in many different ways by different models (Baumeister, 2002; Mischel et al., 1989; Tangney, Baumeister, & Boone, 2004). This thesis

uses the strength model of self-control which defines it as the individual's capacity for controlling responses and adjusting them to certain standards (ideals, values, morals, and social expectations) in order to support the pursuit of long-term goals (Baumeister, Vohs, & Tice, 2007). The idea of individual responsibility and controllability of stigma is an important part of anti-fat attitudes and, consequently, of the idea that weight stigma might help reduce weight. If all it took to lose weight was diet control and increased physical activity, then self-control would be the only predictor of weight.

Indeed, self-control resources have been shown to be a good predictor of both calorie consumption and physical activity (Wills, Isasi, Mendoza, & Ainette, 2007), as well as overall weight loss in specifically designed programs (Crescioni et al., 2011). On the other hand, as a limited and expendable resource (Dang, 2018; Hagger et al., 2016; Hagger, Wood, Stiff, & Chatzisarantis, 2010), individual's beliefs about their own self-control capacities, as well as previous tasks that have required the individual to control themselves, have a negative impact on future self-control tasks. Importantly, previous studies suggest that the mental energy used to deal with stigma may negatively deplete self-control resources (Emile, d'Arripe-Longueville, Cheval, Amato, & Chalabaev, 2015; Inzlicht & Kang, 2010).

Individuals who have been depleted of self-control resources have been shown to regulate physical demands more poorly, and to exercise less regularly (Hagger et al., 2010). Additionally, feeling compelled to exert self-control requires more resources than exerting it for autonomous reasons (Muraven, Gagné, & Rosman, 2008). Thus, individuals might feel forced to exert self-control resources to deal with weight stigma, instead using them for the practice physical activity or limit their calorie intake. Previous research has shown that endorsement of age-related stereotypes of physical activity predicted ego depletion (operationalized as subjective vitality) among older adults (Emile et al., 2015). Subjective vitality is defined as the energy that one can harness or regulate for purposive actions (Ryan

& Deci, 2008). It has been shown to be situation specific, and a valid marker of ego depletion (Muraven et al., 2008)

Major, Hunger, Bunyan, and Miller (2014), tested this hypothesis in weight stigma by showing different articles to two groups of women with obesity. One of the groups was exposed to a stigmatizing New York Times article; "Lose weight or lose your job", while the other group read a second, modified article: "Stop smoking or lose your job". The women were then placed in a waiting room where snacks were made available for them. As expected, the group that was stigmatized consumed more calories than the control group and reported less self-efficacy for dietary control.

More research is needed in order to understand the effects of weight stigma on self-control, previous research has demonstrated that weight stigma can produce negative psychological consequences closely related to sego depletion (Major et al., 2012).

3.1.2. Exercise avoidance.

Higher weight individuals might also attempt to circumvent weight stigma by avoiding places and people that are associated with it. A study which examined the relationship between weight stigma, exercise motivation and exercise behavior found that weight stigma could decrease physical activity through its impact on avoidance motivation (Vartanian & Shaprow, 2008).

Vartanian and Novak (2011) further tested this hypothesis by having individuals answer questions concerning different weight stigma processes, measures of body dissatisfaction, and avoidance of exercise, as well as self-reported exercise behavior. They found that weight stigma was positively related to avoidance of exercise.

Recent studies have both observed (More, Phillips, & Eisenberg Colman, 2019), and failed to replicate the relationship between stigma and avoidance of exercise (Himmelstein, Puhl, & Quinn, 2018). Evidence regarding the role of weight stigma and its interaction with

different processes remains limited as well as studies that measure physical activity in an objective manner (i.e., accelerometers). Vartanian and Novak (2011) limited their study to two of the said processes: weight stigma internalization and perceived discrimination, while all studies mentioned in this section used survey data in their studies.

Chapter 4: Sources of Weight Stigma

Weight stigma is pervasive. It has been shown to have prevalence rates similar to gender and race based discrimination, especially for females (Puhl, Andreyeva, & Brownell, 2008). Higher weight individuals have reported high rates of weekly discrimination from sources like strangers, spouses, friends, parents, and the media. This hints towards a systemic spread of weight stigma where higher weight individuals are experiencing it at increasing rates and in almost every context of their lives.

Over the years clear and consistent evidence of stigmatization has emerged over a couple of different areas of human development like employment, interpersonal relationships, educational and healthcare settings, and the media. The next section shows the evidence of discrimination in different contexts in order to elucidate the functioning of weight stigma and its systematic prevalence.

4.1. Employment Settings

There is an extensive body of research concerning anti-fat attitudes, discrimination, and perception of stigma in the workplace. Mainly, the results concern hiring prejudice, inequity in wages, and perceptions of stigma in work settings (Puhl & Brownell, 2001; Puhl & Heuer, 2009). For example, in a sample of students the desire to work with thin individuals is higher than the desire to work with obese individuals (Klassen, Jasper, & Harris, 1993), while another study that asked people to rate obese applicants found that obese applicants were ranked as lacking self-discipline, supervisory potential, and personal hygiene (Rothblum, Miller, & Garbutt, 1988).

On the receiving end, a large sample study (n=2,249) found that 25% of participants had experienced job discrimination because of their weight (Puhl & Brownell, 2006). A wage gap similar to that based on gender has also been reported, ranging from 0.7 to 3.4% for obese men, 2.3 to 6.1% for obese women. This points to overt stigma within employment

setting, without necessarily delving into the way in which stigma is processed by the individuals. Contextual factors and sources of stigmatizing attitudes (i.e., how stigma arises) against obese individuals is also a question that remains to be answered.

4.2. Close Interpersonal Relationships

Higher weight individuals could also face stigma in close interpersonal relationships from romantic partners, family members, and friends. For example, a study in which people were shown descriptions of a personal advertisement of a female individual seeking a dating partner found that large-size descriptors resulted in negative evaluations of that individual by both women and men (Smith, Schmoll, Konik, & Oberlander, 2007). These results hint at the hindering potential of weight stigma on dating prospects. Additional research has found that overweight women are less likely to be dating than thinner peers and that body weight was negatively correlated to relationship satisfaction (Sheets & Ajmere, 2005).

Weight stigma in the interpersonal context is not limited to romantic relationships. In fact a study that questioned over 2,000 obese women found that the most frequent source of stigma in their lives, accounting for 72% of all discrimination, was family members (Puhl & Brownell, 2006). This is especially concerning because of the proximity and inevitability of these relationships. The same study also found that stigma is present in other important areas of the individual's life like education and healthcare.

4.3. Educational Settings

Weight stigma in the educational setting has received far less attention than that of workplace and healthcare. However, there is still convincing evidence that shows the presence of weight-based discrimination from teachers, peers, and parents (Puhl & Brownell, 2001; Puhl & Heuer, 2009).

Weight bias might contribute to educational disparities for obese students. This was observed in a large Swedish study that looked at higher education attainment as a function of

weight category and controlled for factors like intelligence and social standing (Karnehed et al., 2006). They found that being obese by age 18 was related with a lower chance of attaining higher education. Further studies have confirmed these results for women and in other countries (Crosnoe & Pagan, 2007).

4.4. Healthcare Settings

Health-care professionals have also been found to endorse weight stigmatizing attitudes (Brown, 2006; Puhl & Heuer, 2009). These attitudes could shape the interactions that higher weight individuals have in their everyday lives, their quality of life, and their health (Pearl & Puhl, 2018). Thus, understanding how these attitudes work is important to combat the negative consequences of stigma and the overall pervasiveness of it.

Physicians, nurses, psychologists, and medical students have been found to endorse negative attitudes toward obese patients including beliefs that obese patients are lazy, noncompliant, undisciplined, and have low willpower (Puhl & Brownell, 2001). This is in spite of the fact that self-reported levels of weight management motivation in obese patients has been found to be significantly higher than what is perceived by physicians (Befort et al., 2006). This is especially relevant since these populations are not only trained and well informed in the complex causes of obesity, but also because they are the professionals most likely to be contacted by the patients for weight loss or to address health issues associated with obesity.

Results also suggest that physicians view obesity as a problem mainly caused by behavioral issues of which the patient is entirely responsible (Foster et al., 2003). It is important to note, however, that practitioners with higher levels of stigma were less likely to subscribe to medical journals, suggesting a lack of current knowledge regarding obesity and an unwillingness to update that knowledge (Bocquier et al., 2005).

As discussed previously, all forms of obesity treatments prescribed by physicians have a behavioral component consisting of lifestyle changes in physical activity and diet (Butryn et al., 2011). This component of the treatment is likely to be addressed by dietitians and exercise professionals, both of which have also been found to endorse weight stigma.

Evidence suggests that dietitians tend to rate individuals with obesity less positively than people who are overweight. This lesser rating is also accompanied by frustration about a "lack of commitment", poor motivation and compliance, as well as unrealistic expectations of their patients with obesity (Campbell & Crawford, 2000; Harvey, Summerbell, Kirk, & Hill, 2002). A recent systematic review found that 73% of papers investigating bias among dietitians found weight bias (Panza et al., 2018).

In the case of exercise professionals, 85% of papers investigating bias among them found weight bias (Panza et al., 2018). Men have been found to have higher levels of stigma and are less likely to intervene in a situation where a trainee is the victim of stigma (Peterson, Puhl, & Luedicke, 2012). Beliefs of individual causes of obesity are related to higher levels of weight stigma, while more knowledge on obesity predicts less negative attitudes (Setchell, Watson, Gard, & Jones, 2016).

There is evidence to support that students in degrees related to physical activity and exercise might have higher weight stigmatizing attitudes than psychologists or students enrolled in other degrees (Chambliss, Finley, & Blair, 2004; Langdon, Rukavina, & Greenleaf, 2016). Previous studies have compared the prevalence of weight stigmatizing attitudes in exercise science students and exercise science professionals to other groups, arguing that stigma attitudes are supported by an over-investment in physical attributes, a defining characteristic of these populations.

To give an example of these comparisons, O'Brien, Hunter and Banks (2007) compared exercise science students to psychology students and found that the former had

higher levels of implicit bias. Within that group of students, the higher the years of study the higher the bias. Sampedro, Quiñones, Márquez and Robles (2012) found similar results when comparing exercise science students to kindergarten and high school students. The same study also found that within all students, those most interested in exercise tend to show more stigma. These results indicate a relationship between the investment in the value of physical attributes (which characterizes this population) and an increase in stigmatizing attitudes. This is possibly because they do not perceive the same investment in the obese population. Outside of the academic field, Fontana, Furtado, Mazzardo, Hong, and de Campos (2017) and Robertson and Vohora (2008) found no difference between exercise science students and professionals, nor did they find differences between exercise professionals and regular exercisers respectively.

Deepening the exploration of these populations, Peterson et al. (2012) looked at the differences in ability and performance expectations, attributions, and attitudes when they asked exercise science students about a picture of an overweight vs. a non-overweight teenager. They found that expectations and attributions were lower when the student in the picture was overweight, especially if she was female. Participants also endorsed negative attitudes against overweight students regardless of their weight.

Higher anti-fat attitudes are related to a high internalization of an athletic body type ideal (Langdon et al., 2016). The study of this particular population is of great importance because physical activity has proven to be a positive health factor for everyone, but especially for people with obesity (Allan, 1994). The thin body ideal is hypothesized to emerge from perceived media pressure and information (Langdon et al., 2016) and refers to the generalized idea that thin bodies are more attractive than higher weight ones.

4.5. Internet/media

In the current globalized world, it is no surprise that the media perpetuates thin and athletic body ideals (Fardouly & Vartanian, 2016; J. K. Harris et al., 2018), which may be stigmatizing. The acceptability of stigma in the media can be highlighted specifically in entertainment, where obese characters tend to be the object of ridicule or used as the targets of jokes regarding their weight (Greenberg, Eastin, Hofschire, Lachlan, & Brownell, 2003). It is important to note, however, that the comedic predilection of the media for higher weight individuals does not make them the subject of excessive representation. A study attempting to measure the prevalence of different body types found that only 5.10% of characters in 89 programs with a total of 1,254 characters were overweight (Mastro & Figueroa-Caballero, 2018).

Representation of higher weight individuals in popular entertainment media has decreased, and not only in adult content. A study that examined 1,221 cartoons with over 4,000 cartoon characters produced between 1930 and the mid-1990s found that overweight characters are becoming less and less common in cartoons, while underweight characters are proliferating. Nevertheless, socially undesirable traits like unattractiveness, lack of intelligence, and unhappiness are still associated with the overweight characters (Klein & Shiffman, 2005; Hugh Klein & Shiffman, 2006). These results are especially interesting considering that exposure to different types of media was associated with stigmatizing attitudes (Latner, Rosewall, & Simmonds, 2007).

It is interesting to note, however, that although there is surmounting evidence of stigma in entertainment media, as well as advertisement and news sources (Puhl & Heuer, 2009), research on social media use has remained scarce.

Social media use has dramatically increased among adults this past decade, rising from 23% in 2007 (Chou, Hunt, Beckjord, Moser, & Hesse, 2009) to 62% in 2017 (Shearer & Gottfried, 2017). In the U.S.A., Twitter is the core of "obesity" and "fat" related communications. 90% of posts on social media containing the words "fat" or "obesity" were found on Twitter, while Facebook, blogs, forums and internet comments contained the other 10% (Chou, Prestin, & Kunath, 2014). Out of tweets containing the words "fat", "obesity", and "overweight" the word "fat" is by far the most common appearing in 92% of tweets, while only 6% used obesity and 2% used overweight (Chou et al., 2014). This makes Twitter the most important place to study social networks, and the word "fat" the keyword to use when looking for information related to weight.

Posts containing the word "fat" have been found to have a mostly negative connotation (Chou et al., 2009; Harris, Moreland-Russell, Tabak, Ruhr, & Maier, 2014a; Lydecker et al., 2016; So et al., 2016). For example, one study found that 56% of the messages containing the word "fat" were explicitly negative towards higher weight individuals (Lydecker et al., 2016). Which suggest the presence of weight stigma, the pervasive social devaluation and denigration of overweight and obese people. Stigma has been shown to be related to unhealthy behaviors, such as high calorie intake (Araiza & Wellman, 2017), binge eating (Durso et al., 2012), and physical inactivity (Vartanian & Novak, 2011). Seemingly informative messages such as those published in news media to incentivize weight loss have actually been found to have the opposite effect, increasing calorie intake and reducing self-efficacy for dieting (Major et al., 2014).

The fact that the word "fat" works as an adjective with a generally negative connotation (i.e., fat person), and as a noun that is commonly associated with exercise (i.e., burn fat) could result in a bundling together of both concepts by Twitter's recommendation algorithm (Salganik, 2017).

Communications concerning exercise on Twitter have actually yielded mixed consequences in individual's behaviors both at individual and group levels. On the one hand Twitter users have been shown to have increased levels of physical activity when they post more exercise related content (Nishi, Christakis, & Rand, 2017; Nishiwaki et al., 2016). For example, a study that examined the density of exercise related tweets in neighborhoods in different cities in the U.S. found that a higher number of tweets was related to more physical activity in that neighborhood (Nguyen et al., 2016). On the other hand, exposure to specific content that promotes athletic bodies (fitspiration) or extremely thin ones (thinspiration) has been found to have varied effects. Although both types of account make weight the center of their message to attract their respective audiences, exposure to thinspiration accounts but not fitspiration ones is related to increased eating disordered symptoms (Griffiths et al., 2018). This might be because thinspiration accounts share images of extremely thin individuals which prompts physical appearance comparisons by the users.

Chapter 5: General Problematic

The previous chapters have highlighted the ever-present prevalence of stigma in the lives of higher weight individuals, how these individuals respond to this stigma, and the stigmatizing attitudes endorsed by people around them. The relationship between weight stigma and physical activity has been the focus of this thesis, be it in the digital environment where exercise promotion and stigma might be overlapping, the attitudes of exercise science students and professionals, or the responses to stigma by its targets. There are limitations to current research in the perspectives of the perceiver and the target of stigma, and in the cultural context. The main objective of this thesis is to understand the effect weight stigma has on physical activity at a macroscopic level by examining social media, and at an individual level, by examining stigma in perceivers like exercise science students, and in the targets of stigma by looking at the general population, and individuals with obesity.

From the perceiver's perspective, at the macroscopic level, social media represent a potentially important source of weight stigmatization that has remained understudied, even though its relation to unhealthy behaviors and negative health consequences makes it a public health issue. A recent study that examined previous findings concerning the effects of digital technology use (including social media) on wellbeing noted that the effects were minimal and did not justify policy change (Orben & Przybylski, 2019). I argue that this is related to methodological problems where social media is often measured by a single self-reported item (i.e., Fardouly, Willburger, & Vartanian, 2017; Manago, Ward, Lemm, Reed, & Seabrook, 2015) or operationalized simply as screen time (Liu, Wu, & Yao, 2016). This methodology does not consider the variety of applications available to the user or the distinct social communities inherent to an environment like a social network.

In addition to these methodological arguments, exploring the prevalence, content and structure of weight stigma online is important because social media has become an important source of health information (Eysenbach, 2008; Li, Wang, Lin, & Hajli, 2018). These sites help 15% of its adult users obtain health information such as nutritional and exercise guidance (Fox, 2011). More particularly, within said communications weight loss messages are common (Lydecker et al., 2016). These messages however, tend to be explicitly negative with a particular focus on fat-shaming (Lydecker et al., 2016). Additionally, communities that promote weight loss do so while coexisting and overlapping with fitness promoting ones (Harris et al., 2018; Tiggemann et al., 2018). This means that users looking for information related to healthy exercise habits might inadvertently end up receiving weight loss or stigmatizing content.

Still in the perceiver's perspective, but at the individual level the potential overlap between stigmatizing content and exercise promotion could be an indicator of endorsement of stigmatizing attitudes by people interested in exercise. This endorsement has already been widely explored by other studies reviewed in the previous chapter (i.e., Alameda & Whitehead, 2015; Chambliss, Finley, & Blair, 2004; Langdon, Rukavina, & Greenleaf, 2016). As mentioned in chapter two, however, little research has been conducted on the relationship between explicit weight stigmatizing attitudes and discriminatory behaviors. This means that while there is a large amount of evidence suggesting that there are indeed individuals that endorse weight stigmatizing attitudes the evidence that those attitudes are actually related to behaviors that negatively affect higher individuals has remained scarce, with some studies suggesting no relationship (O'Brien et al., 2008). More specifically, the explicit-conscious, implicit-automatic relationships shown in chapter two have, to our knowledge, only been explored by one study where they found a relationship between disgust sensitivity and avoidance of pictures of individuals in higher weight categories, especially

those deemed to have higher controllability over their condition (Pryor et al., 2004). Understanding these relationships is important because automatic behaviors are not under the control of the perceiver and thus could help draw conclusion outside of laboratory settings where the individual might feel pressure to be socially desirable.

Switching our focus to the perspective of the target of stigma at the individual level chapter three also showed that the targets of stigma handle stigma through different processes. Chapter three included the definitions of perceived discrimination, weight stigma concerns and weight bias internalization, as well as motivation to avoid exercise. These processes have similar health related outcomes and how they interact remains to be studied, as most current research has investigated them separately.

The potential interdependence of these processes is highly relevant in understanding how stigma affects health behaviors. Current studies concerning the effects of stigma on the target's physical activity have done so by using self-reported measures (More et al., 2019; Vartanian & Novak, 2011; Vartanian & Shaprow, 2008), and generally incorporating only American or higher income country populations (Puhl & Brownell, 2001; Puhl & Heuer, 2009).

Based on the theoretical propositions and gaps in our current understanding of weight stigma's relationship to physical activity across different mediums and actors, three main questions were posed in this doctoral work:

At the perceiver's macroscopic level, is stigmatizing content consistently being produced online and is it related to exercise promoting content?

At the perceiver's individual level, is do weight stigmatizing attitudes predict discriminating behaviors in exercise promoters?

At the individual level of the targets of stigma, how does weight stigma affect physical activity habits of the general population and individuals with obesity?

In order to answer these questions four studies were designed and implemented. The studies relied on four different sets of data, one cross-sectional, one mined from the internet, one longitudinal, and one experimental. The population that provided this information ranged from Twitter users, exercise science students, and France and Mexico's obese and general populations. Specifically, the first study used data mining techniques to extract 3,772,507 tweets containing the words "fat" or "exercise" to examine the relationship of these concepts online. The second study used a computer-based questionnaire and reaction time task to evaluate attitudes and behaviors of 175 exercise science students. Study three is a transversal study designed to study the reactions of people with varying BMI by questioning 200 French and 153 Mexican, general population individuals. Finally study four was designed to expand on the results of study three in a longitudinal manner by tracking the weight stigma concerns and physical activity habits of 58 individuals with obesity. Different data analysis techniques were required given the differences in populations and methods. Among them were natural language processing, network analysis, multiple linear regression, structural equation modeling, and hierarchical linear modeling.

Chapter 6: From the Perceiver's Perspective, Is There an Overlap Between Fat-Talk and Exercise-Talk in Social Media Communities?

Chapter four highlighted the ever-present prevalence of stigma in the lives of higher weight individuals, while chapter two focused in the attitudes that surround these individuals. There are, however, limitations to current research in the perspectives of the perceiver and the target of stigma, the cultural context, and, especially, in the relationships between them. The main objective of this thesis is to understand the effect weight stigma has on physical activity across actors and mediums.

The previously mentioned Major, Tomiyama, and Hunger model (2018) makes the case that societal weight stigma encompasses all other forms, actors, and consequences of stigma. This means that stigma is a cultural norm that is perpetrated by social interactions, cultural expressions, entertainment, and every other form of social consensus.

Weight stigma online, however, has remained understudied even though its relation to unhealthy behaviors and negative health consequences makes it a public health issue. It is important, then, to determine who is exposed to weight stigmatizing messages and content and whether those exposed could be negatively affected by it or are people actively looking for this kind of message for amusement or other purposes.

Interestingly, around 62% of "fat" containing messages have been found to be overtly pro-thin (i.e., fat is used in the context of weight loss; Lydecker et al., 2016). Pro-thin bias is a preference for thin bodies in others or oneself and is closely related to weight stigma, as people with greater anti-fat bias are also those who show a greater preference for thinness (Carels & Musher-Eizenman, 2010).

One topic that is particularly likely to show pro-thin bias is exercise-based messages. Fitspiration (amalgamation of the words fitness and inspiration) and thinspiration (amalgamation of the words thin and inspiration) communities have been identified on

Twitter. Their goal is to motivate people to engage in exercise with fitness or weight loss (pro-thinness) goals, respectively (Tiggemann et al., 2018). Hence, someone looking for exercise-related information on Twitter might unknowingly be immersed in a pro-thinness and weight stigmatizing network, which could have negative impacts on overweight people's willingness to engage in exercise. Supporting this hypothesis, fitspiration communities have been shown to have a small overlap with pro-thinness ones (Tiggemann et al., 2018). Another study looking at similar communities found that fitspiration tweets were promotional and focused on nutrition and exercise, while thinspiration ones came from individuals, focused on thinness and disordered eating behaviors, and contained images of extremely thin women (Harris et al., 2018).

While a growing body of research has started to examine weight stigma on Twitter, these studies have focused on describing its content (Chou et al., 2014; Lydecker et al., 2016; So et al., 2016)[1]. One question that deserves further investigation is whether there are communities of people who mainly tweet about exercise and fat. This question is highly relevant to weight stigma research because it would open the possibility of studying these communities. If they exist, other questions their structure and whether they overlap can be answered.

6.1. Study 1: Are the People Tweeting About Exercise Also Tweeting About Fat?

6.1.1. Objectives and hypotheses.

The focus on weight when promoting exercise could be particularly prejudicial if higher weight users are the ones searching for exercise-related information. Indeed, these users could be exposed to stigmatizing content if there is an overlap in themes and users.

[1] The case could be made for the inclusion of cyberbullying literature since it has been shown to have negative effects at the individual level (i.e., Gámez-Guadix, 2014). The current study, however, focuses on the stigma against the concept of fatness and its utilization by exercise promoters and not on directed individualized aggressions, as the concept of cyberbullying implies (Slonje & Smith, 2008). The difference can be made clear by the distinctions between stigma against the concept of "fatness" and stigma against the higher weight individual (B A Teachman & Brownell, 2001).

Therefore, this study aimed to determine if networks of users consistently talking about exercise (not just using fitspiration and thinspiration hashtags) and fat exist on Twitter (objective 1). Assuming they do, we hypothesized that they overlap (objective 2), and that, in accordance with previous findings, the content of these communities' communications will be negative, or weight loss related (objective 3).

We hypothesized that consistent fat-talking and exercising-promoting users would exists in a connected network, and in an overlapping manner on twitter. Furthermore, we expected the communications of the fat-talk community to be explicitly stigmatizing, while those of the exercise-talk network to be focused on weight loss.

Identifying the structure of fat-talk and exercise-talk networks is important for the development of efficient network interventions, and in order to change the rhetoric of the communications by targeting opinion leaders (Meltzer et al., 2010; Valente, 2012; Valente & Pumpuang, 2007). It could also help predict how weight stigma messages spread from one person to another.

6.1.2. Methods.

6.1.2.1. Data collection.

We collected data using the Twitter Application Programming Interface (API), a web-based program that allows users to interact with Twitter's data (i.e. tweets and metadata). This allowed for keyword searches of all tweets containing the words "exercise" and "fat". These words were chosen because of previous findings that suggest "fat" is exponentially more likely to be used on twitter than other words like "obesity" or "overweight" (Chou et al., 2014), and because the word "fat" is commonly used in exercise for weight loss communications (i.e. burn fat), as well as an adjective with a generally negative connotation (i.e. fat person). We implemented these searches on a daily basis, resulting in over five gigabytes of text data collected over a period of 3 months (November 2017 to February

2018). Each daily search provided the most recent tweets of the day (up-to 50,000). It also provided information on how many times each tweet was retweeted, the user-id of the user who produced the tweet, and the number of followers of that user.

6.1.2.2. Community structure and overlap.

In order to determine if networks of users consistently talking about exercise and fat exist on Twitter (objective 1) users who tweeted at least once a week about "fat" or "exercise" were assigned to a core group, while those who only tweeted once in three months about "fat" or "exercise" were assigned to the visiting group. Users who tweeted more than once but not once a week were excluded from the study.

In order to study a network of Twitter users, each user is considered as a node. Nodes can be individual people, public organizations, companies, or universities. A node can follow another node, creating a link (e.g., A → B). In A → B, node A has an out-degree of 1 (because it follows B) and node B has an in-degree of 1 (because it is followed by A). In social networks, the direction of the arrow typically represents information flow, but in the case of Twitter the relationship is inversed because users follow other users to see the content they publicly post, not to send direct information. In short, if node A follows node B (A → B), node A is seeing information posted by node B.

Nodes with a large following within the network have a high in-degree, while nodes following a large number of users within the network have a high out-degree, with the sum of both hereby rereferred to as total-degree. The total-degree distribution tends to be extremely skewed because of the power law (Faloutsos, Faloutsos, & Faloutsos, 1999), which says that most nodes have small or no links while a minority of nodes have most of them (hubs). Hubs with a large in-degree (followed by many) can be identified as the main providers of information (Himelboim & Han, 2014). Additionally, within the social network, communities can emerge (Blondel, Guillaume, Lambiotte, & Lefebvre, 2008). These communities are

composed of users with more connections among them but fewer connections to nodes outside the community which may themselves be part of different communities.

Relationships between users were mapped to allow for social network analysis and to determine network structure. The user-id from the core group was used to identify the followers of each individual user. The relationships were then filtered so as to only include relationships within the core group. Using these relationships, a core fat-talk network and an exercise-talk network were mapped. Additionally, in order to determine if there is an overlap between fat-talk and exercise-talk communities, a combined network was mapped, and the metrics of this network compared to the previous ones. Given the number of users in the visiting groups, the individual mining of followers would have been impossible (140 weeks of constant mining would be needed).

To answer questions regarding structure and overlap (objective 2), four standard network metrics were used: density, average path length, mean total-degree, and clustering coefficient. Density measures how many connections exist in the network and ranges from zero (no connections) to one (all possible connection exist). Average path length refers to the average shortest paths between two nodes and is important because it indicates how far, in average, information must travel to reach from one node to another. Mean total-degree refers to the average number of connections per node and is useful for determining how well connected a network is. Finally, clustering coefficient is a measure of the extent to which nodes in a network tend to cluster together (Newman, 2016), which allows us to understand the network structure in reference to its communities.

Additionally, modularity was calculated within the network. This is the identification of communities within a network based on the similarities between their connections. It was done using the fast unfolding of communities in large networks algorithm (Blondel et al., 2008). This algorithm decomposes the networks into sub-units or communities, which are

sets of highly inter-connected nodes. Four main communities per network were extracted. Hubs were found by ranking the nodes based on their in-degree. This allowed for a linguistic corpus analysis based on the communities of each network.

6.1.2.3. Linguistic corpus.

The linguistic corpus is the whole set of text data (tweets) to be analyzed. Simple Natural Language Processing (NLP) techniques like the division of sentences into individual words (tokenization) and their subsequent analyses in duos or triplets (n-grams) were used to analyze this data. Latent Dirichlet Allocation (LDA), which allows for the grouping of observations (words) to be explained by unobserved groups (themes), was also used. A total of 3,772,507 tweets were collected, however out of those, non-English-language tweets (n=510,145) and tweets from people that were not in the core or visiting categories (n=1,291,155) were removed. As a result, the total corpus was reduced to 1,971,207 tweets.

6.1.2.4. Linguistic n-grams.

In order to confirm that the communicational content of the fat-talk and exercise-talk network is explicitly negative, or weight loss related (objective 3) the tweets were divided into the four main communities of each core social network. After that, a list of linguistic bigrams and trigrams that excluded prepositions, conjunctions, and linguistic fillers was generated. Finally, a Latent Dirichlet Allocation (LDA) model was applied to differentiate individual unobserved clusters of words, which allowed for a qualitative lexical text analysis and extraction of common themes within the communities (Blei, Ng, & Jordan, 2003; Bolden & Moscarola, 2000).

6.1.3. Results.

6.1.3.1. Network characteristics.

The fat-talk and exercise-talk networks were similar in size, both in its core (N_{fat}=2,223; $N_{exercise}$=3,573) and visiting forms (N_{fat}=737,102; $N_{exercise}$=703,948). The number

of tweets, however, was smaller in the core fat-talk network. A total of 3,573 users consistently use their profiles as a way to communicate about exercise, while 2,223 use them for "fat" related communication, thus indicating the existence of dedicated networks. The number of users and tweets in the visiting and core networks, as well as the four main communities, are described in Table 1.

	Exercise	Fat
Users		
Visiting	703,948	737,102
Core	3,573 (100%)	2,223 (100%)
Core (no isolates)	3,557 (99.55%)	1,992 (89.61%)
Community #1	1,371 (38.37%)	674(30.32%)
Community #2	1,113 (31.15%)	286 (12.87%)
Community #3	475 (13.29%)	243 (10.93%)
Community #4	457 (12.79%)	161 (7.24%)
# Tweets		
Visiting	703,948	737,102
Core	399,641	130,516
Community #1	142,448	50,613
Community #2	41,220	4,783
Community #3	11,837	2,295
Community #4	12,349	3,206

Table 1. Number of users and tweets by network and community.

6.1.3.2. Network structure.

A visual representation of the fat-talk and exercise-talk networks was produced (Figure 5). This allowed for a quick identification of their structure and communities, which was then extracted using the fast unfolding of communities in large networks algorithm (Blondel et al., 2008). The mean total-degree is larger in the exercise-talk network (13.40) than in the fat-talk one (6.62) indicating that the exercise-talk network users are more connected overall, which makes the average path length smaller (3.79 for the exercise-talk, and 6.08 for the fat-talk network). The communities within the networks, however, seem to be more clustered together in the fat-talk network (0.17) than in the exercise-talk one (0.09),

thus, creating a divided network with a larger diameter (21 for the fat-talk network compared to 18 in the exercise-talk one).

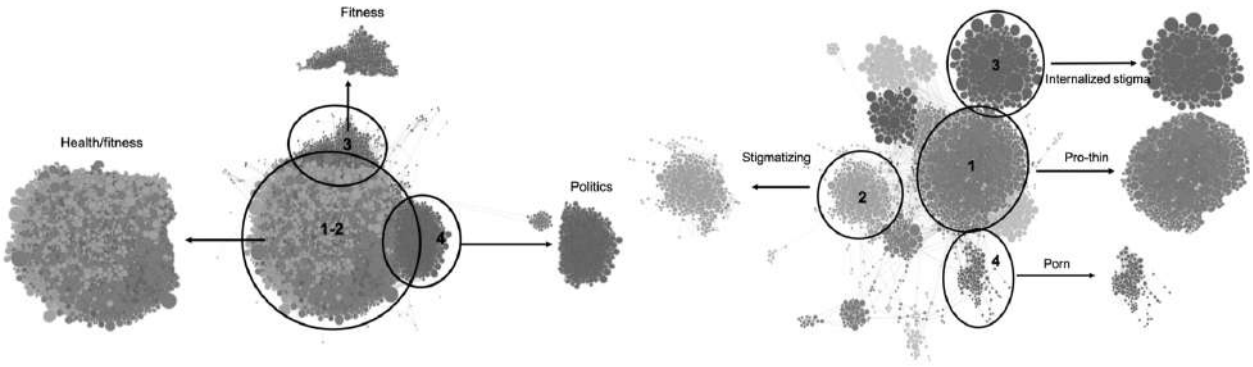


Figure 5. Graphical representation of the exercise-talk and fat-talk networks divided by community and theme. Note: Left: core exercise-talk network, right: core fat-talk network; Size of node: in-degree; Number: modularity class (community).

6.1.3.3. Overlap between networks.

A small percentage (7.6%) of users are in both networks (Figure 6). It is worth noting that the largest hub is shared by both the exercise and fat-talk networks. A more complex overlap is observed when looking at the metrics of the combined network. The mean total-degree of the combined network (12.91) is larger than the averaging of the means of the individual networks (9.71). The average path length (4.33), and the clustering coefficient (0.11) for the combined network drop below the averages of both individual networks, while the diameter is widely reduced from the fat-talk network. This could indicate that the users in the exercise-talk network serve as a connecting bridge between highly scattered communities of the fat-talk network. Table 2 shows descriptions of the networks.

	Exercise-talk network	Fat-talk network	Combined network
Nodes	3,573	2,223	5,695
Edges (Links)	47,695	13,512	73,520
Semi-isolates	16	231	174
Nodes (without isolates)	3,557	1,992	5,521
Edges (without isolates)	47,677	13,187	73,271
Number of Communities	18	25	35
Modularity (without isolates; Resolution 1.5)	0.24	0.55	0.21
Density (without isolates)	0.004	0.003	0.002
Average path length	3.79	6.08	4.33
Diameter	14	21	14
Mean total-degree	13.35	6.01	12.91
Mean total-degree (without isolates)	13.40	6.62	13.27
Mean clustering coefficient	0.09	0.18	0.11

Table 2. Descriptive statistics of the exercise-talk, fat-talk and combined networks.

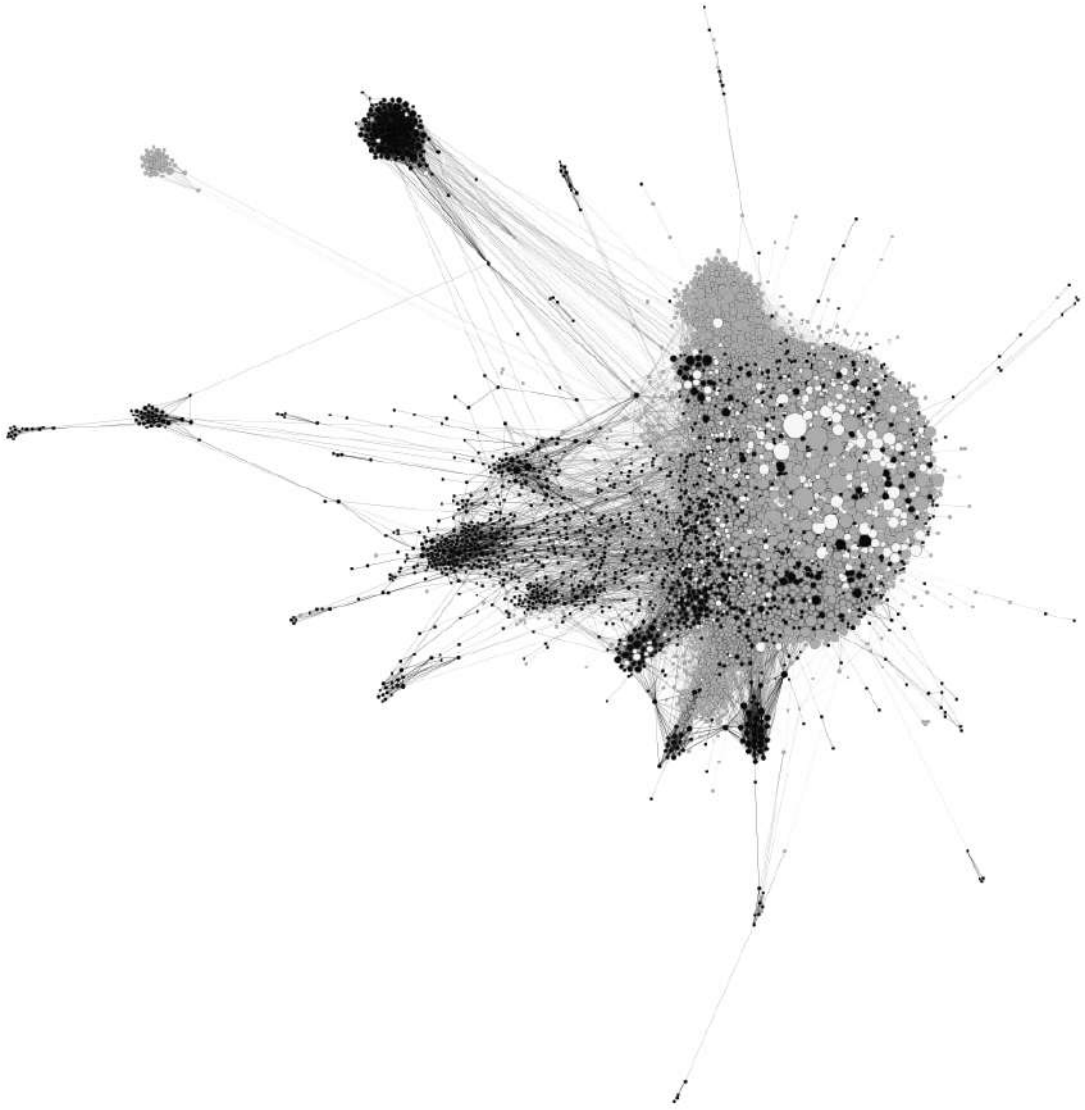


Figure 6. Combined network showing exercise-talk users, fat-talk users and users that belong to both communities. Note: Gray = exercise-talk (57.86%); Black = fat-talk (31.12%); White = both (7.60%).

6.1.3.4. Content of communications.

In order to understand the overall tweet content of each group, each individual tweet was divided into individual words (tokenization), pairs of words (bigrams) or triplets of words (trigrams). The most common bigrams can be found in the annexes. The lists reveal interesting patterns like themes of physical fitness and health in the exercise-talk network's communities one and two. Community three is mostly focused on fitness for health, while

community four has a religious and bellicose connotation (i.e., exercise your freedom of speech). These last words, however, have exactly the same count, which could indicate that they are all in the same tweet but retweeted by a large number of people. As for the fat-talk network, the first community contains mainly words regarding weight loss or fat burning and the second community has a wide range of insults. The third one is also composed of insults, but regarding food and eating behaviors. Finally, the fourth community is highly sexual.

To further continue the analysis of the tweets, Latent Dirichlet Allocation (LDA) allowed us to divide the individual words of tweets, as well as the bigrams into latent unobserved groups. This is to say that groups of words that tend to appear together were observed and analyzed in order to understand the themes about which each group communicates. The descriptions of the most common themes emerging among each of the main communities of the core user networks of fat-talk and exercise-talk can be found in the annexes.

These results confirm the hypothesis that in the fat-talk network there is mostly a negative connotation. They also show that the communities clustered together in the networks by theme as well as by network-homophily. Figure 5 shows the networks labeled by theme.

6.1.4. Discussion.

This study found a large core network of users tweeting about exercise or fat at least once per week. Dense and highly clustered communities were found within the individual networks. It is interesting to note that while the geodesic distance in the exercise-talk network was higher than that of the fat-talk network, the clustering coefficient was not, corroborating previous findings that state that weight-loss promoting communities are more closely knitted together than pro-health ones (Tiggemann et al., 2018), and that health-promoting tweets were focused on nutrition and exercise, while pro-thinness ones were focused on thinness and disordered eating behaviors (Harris et al., 2018). The combination of both networks showed a

mild overlap between them which could indicate that the users in the exercise-talk network serve as a connecting bridge between highly scattered communities of the fat-talk network. This is consistent with previous studies that show the prevalence of pro-thin type communications among fat-talk networks in Twitter (Chou et al., 2014; Lydecker et al., 2016; So et al., 2016). These results are relevant since the way in which a user encounters new friends on Twitter is algorithmically confounded, as it recommends people whom he or she most likely knows based on his or her friend network (Salganik, 2017). This, in turn, might lead to people looking for pro-health advice to find themselves within a stigmatizing network.

As for sources of information the core network tends to prefer grassroots accounts than celebrities or big companies as their sources of information, contrary to those in the visiting network. This is in line with findings of a previous study of visiting and core cancer networks (Himelboim & Han, 2014).

Finally, we wanted to know what people were tweeting and sharing about fat and exercise. We found that the networks were not only divided as a function of their interconnectivity, but by their topics. In the case of the exercise network, fitness and health-related exercise tweets were found to be the most common reasons for practicing physical activity (Kilpatrick, Hebert, & Bartholomew, 2005). Other topics were more generic and unrelated to physical activity, like English learning and politics. In the fat-talk network, on the other hand, the most popular topics were weight loss-related tweets. This resembled previous findings where weight management was reported as an important motive for practicing physical activity (Kilpatrick et al., 2005) and others where weight loss was a common theme of Twitter (Lydecker et al., 2016). The second most common category of tweets in the fat-talk network was explicit weight stigmatization, confirming previous findings (Chou et al., 2014; Lydecker et al., 2016; So et al., 2016). Internalized stigma tweets, which is to say tweets making explicit self-directed stigmatizing comments, were found in a

specific sub-cluster that also happens to house pro-anorexia accounts. And finally, a cluster of porn related accounts was found that held no relation to the study.

Apart from the direct descriptive implications of the study, the results can be framed within the broader theoretical framework of social contagion theory (Christakis & Fowler, 2013; Smith & Christakis, 2008). This theory states that networks influence health via social support, influence, engagement, and contact. The structure of this network actually has an influence on the adoption of health-related behaviors, with highly clustered networks being better for behavioral contagion than randomly wired ones, for example (Centola, 2010). The fat-talk network in particular is shown to have clustered communities within it. These communities have explicitly stigmatizing messages and pro-thinness communications that could arise contagion of these sorts of attitudes. Further study is needed to address the possible transferable nature of stigma.

This has a wide array of public health implications. Understanding the transfer and propagation of stigma could help in the design of campaigns directed at prevention (i.e., via information), inoculation (i.e., coping mechanisms), and intervention of stigmatizing attitudes in a large-scale fashion. Specifically, individual targeting to the hubs that are shared in both networks could result in a reframing of the health and exercise promotion communications (Valente & Pumpuang, 2007). Another important alternative to consider is the targeting of subcommunities, like the pro-thinness one in the fat-talk network or the pro-health one in the exercise-talk network, to try and change the rhetoric of the communications (Meltzer et al., 2010; Valente, 2012).

While this study has described the structure and themes of fat and exercise networks on Twitter, some important questions remain. Questions remain about the influence of the content posted in Twitter on in other user's levels of physical activity, as well as the

predictive capacity of the textual content produced by the users over their weight stigma attitudes or physical activity habits.

This study adds to existing knowledge in three important ways: (1) it determined the existence of a dedicated weight stigmatizing community, (2) it showed partial overlap between exercise-talk and fat-talk communities on Twitter, and (3) it confirmed previous findings regarding the content of communications within and between these communities.

Chapter 7: Are Weight Stigmatizing Attitudes in the Perceivers related to Reflective/Automatic Responses to Higher Weight Individuals?

The results presented in the previous chapter indicate a potential overlap between stigmatizing content and exercise promotion. It is possible that individuals who are interested in exercise promotion endorse weight stigmatizing attitudes and thus, produce stigma related content when promoting exercise. Indeed, the relationship between stigmatizing attitudes and the promotion of exercise has been observed outside of the internet with different consequences (Harris, 1993; Harris, Cale, Duncombe, & Musson, 2018).

The second question addressed in this thesis had to do with the relationship between stigma and behaviors in exercise science students. Chapter two made it clear that there are covariations of dualities that have seldomly been explored in weight stigma research. Specifically, the relationship between implicit bias and automatic responses has not been explored and we believe deserves attention.

The dual-process reactions to perceived stigma mode presented in chapter two (Pryor et al., 2004) indicates that responses occur in a continuum. In it, initial automatic reactions created by attitudes of the stimulus to which the individual is responding and are later corrected by other, rule-based factors. This means that there are two distinct reactions to be on the lookout for when exploring discrimination, automatic and rule-based, specifically reflective, rule-based processes like intentions.

While there is a large tradition of studies that explore the relationship between weight stigmatizing attitudes and different types of discriminatory behaviors (Gaertner & Dovidio, 1986; Krieger, 2012; Tankard & Paluck, 2017) automatic responses to the stigmatized groups have largely remained unexplored. This question is relevant because it would help measure the types and prevalence of negative behaviors against the target stigmatized group (i.e.,

individuals with obesity). It is important then to determine what the reactions that each representation of stigmatizing attitudes provokes and under what conditions.

Little research has been conducted on the relationship between explicit weight stigmatizing attitudes and discriminatory behaviors, and more specifically none has looked at the explicit-conscious, implicit-automatic relationships. However, one previous study found a relationship between disgust sensitivity and avoidance of picture of individuals in higher weight categories, specially does deemed to have higher controllability over their condition (Pryor et al., 2004). This study aims to study the relationships between explicit attitudes and conscious responses, implicit attitude and automatic responses, explicit attitudes and automatic responses, and implicit attitude and conscious responses.

7.1. Study 2: Weight Stigma and Reflective/Automatic Responses in Exercise Science Students: The Importance of Weight and Sex of Target

7.1.1. Objectives and hypothesis.

Perceiver's responses to their own stigmatizing attitudes have been seldomly explored and could be the source of discriminating behavior that affect people with obesity. This study was designed to test the relationship between behaviors, intentions, and stigmatizing attitudes. Three objectives were drawn: (1) exploring the relationship between implicit bias and automatic responses; (2) exploring the relationship between explicit bias and reflective intentions; (3) exploring the relationship between implicit bias and reflexive intentions; all while looking into differences between the responses to targets of different sexes.

We hypothesized that explicit attitudes would be positively related to reflective intentions; implicit behaviors would have a positive relation to automatic behaviors, and implicit stigma would be negatively related to reflective intentions (Blanton et al., 2009; Cheval et al., 2016).

7.1.2. Methods.

7.1.2.1. Participants.

116 male and 59 female students (Mage=21.72 years, SD=2.14) from the bachelor's in exercise science at the National School of Sport Trainers (ENED) in Mexico City participated in the study as part of one of their classes. All participants gave informed consent prior to participation and received a full debriefing at the end of each session.

7.1.2.2. Procedure

A document thoroughly explaining the objectives of the study was discussed and approved by the research committee of the university. Participants completed the two tasks of the implicit association test, then the manikin task and finally a questionnaire with all self-reported measures. They did so in a quiet computer room in groups of maximum 20 people. The questionnaire was anonymous to encourage honest answers and participants filled out an informed consent before starting. Data collection took place in November 2017. The test was created using the E-prime software and took between 25 and 30 minutes to complete.

7.1.2.3. Measures

In order to measure automatic approach/avoidance responses the manikin task was administered first (Krieglmeyer & Deutsch, 2010). 40 Pictures of 2 models, one male and one female, served as the experimental stimuli.

In each trial of the manikin task a stimulus appears at the center of the screen, as well as a human silhouette (i.e., the manikin) either above or below the stimulus. The participant then must either move the manikin towards or away from the stimulus using the keys "2" (manikin moved downwards) and "8" (manikin moved upwards) on the numeric pad.

The manikin task consisted of two different applications. In the first one the participants were instructed to move the manikin towards the non-overweight stimuli and away from the overweight ones (approach non-overweight). For the second one they had to

move the manikin towards the overweight stimuli and away from the non-overweight ones (approach overweight). The reaction time between picture onset and the participant's response as well as the correctness of the response (approaching when it is appropriate) were measured.

The manikin position and picture type varied randomly over trials and each test had 8 practice trials to make sure the instructions were well understood.

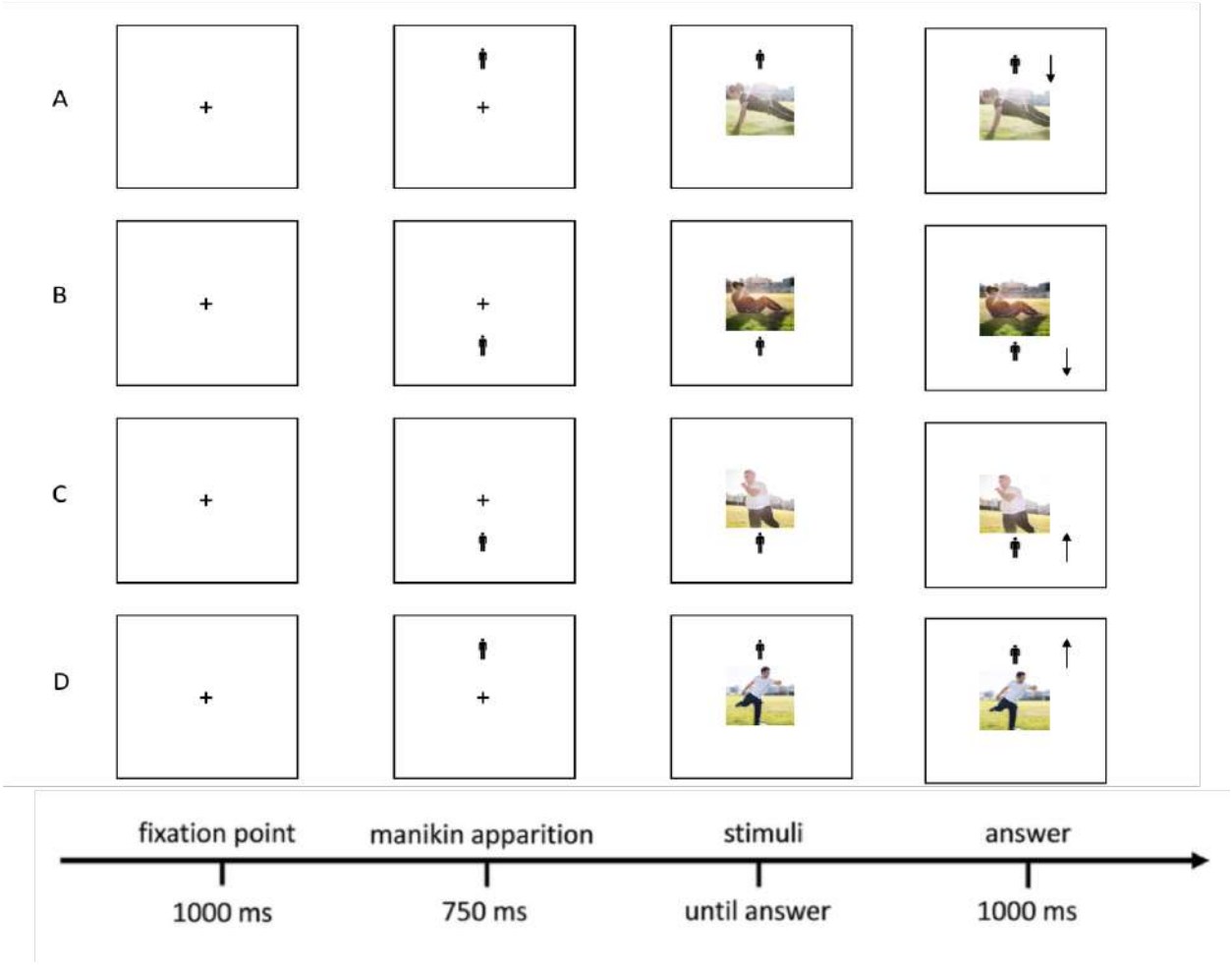


Figure 7. Illustration of the manikin task. “A” represents a trial in which participants were instructed to approach images of non-overweight people (10 trials). “B” represents a trial in which participants were instructed to avoid images of overweight people (10 trials). “C” represents a trial in which participants were instructed to avoid images of non-overweight people (10 trials). “D” represents a trial in which participants were instructed to approach

images of overweight people (10 trials). The arrows down and up indicate the keyboard key on which the participant had to press for the right answer. Adapted from Cheval, Sarrazin, and Pelletier (2014).

The implicit association test is a timed based measure that asks participants to classify randomly ordered stimuli words and images into categories paired with previously established attributes (Greenwald et al., 1998).

The test consisted of two tasks with two different blocks each. The first task evaluated implicit attitudes towards obese people (good/bad), while the second one evaluated implicit stereotypes (lazy/motivated). In the first block the participants were instructed to classify words and silhouettes into categories of "fat" and "thin". For the second block they had to classify a separate set of words into categories of either "lazy" and "motivated" or "good" and "bad" depending on the task. The categories were chosen because bad and lazy calcifications of obese people are common forms of weight stigma (Crandall, 1994).

The *Anti-Fat Attitude* Scale-AFAS (Morrison & O'Connor, 1999), is an explicit measure of anti-fat attitudes. It is composed of five items: (i.e., "On average, fat people are lazier than thin people"). Individuals rate each item on a 5-point Likert scale so that the higher the score, the higher the level of agreement with the statement shown. The measure has demonstrated adequate reliability ($\alpha = 0.75$).

In order to measure *dual process harm-facilitation* behaviors shown when facing different types of trainees, a scale was developed based on Clément-Guillotin, Radel, & Chalabaev, (2015) wo in turned used Cuddy, Fiske, and Glick's (2007) BIAS map. The scale was divided into two subscales: harm and facilitation. The final scale was composed of eight questions in which the participants had to respond to a question based on a stimulus, a regular image of either a male or female, or a manipulated version (making the model look overweight). Individuals rated each item on a 5-point Likert scale so that the higher the score,

the higher the level of agreement with the statement shown (i.e., "imagine you are the trainer of the person in the picture, would you help her?" constitutes facilitation). The measure has demonstrated adequate reliability ($\alpha = 0.93$).

7.1.2.4. Statistical analysis.

A pilot study in which participants not related to the original study (n=10) rated the weight category of the person in the picture was carried out to make sure that the image manipulation was appropriate. Originally 48 Pictures of 2 models, one male and one female, served as the experimental stimuli.

In order to maintain sufficient power for hypothesis testing, a power analysis was carried out using G*Power (Faul, Erdfelder, Buchner, & Lang, 2009). The analysis was based off the hierarchical linear regression that will be used for this study. With a medium effect size (f^2) of 0.16 –extracted from the most recent review of implicit attitudes as predictors of behavior (Dehon et al., 2017)–, an alpha of 0.05, a standard power level of 0.95, and a total of 6 tested predictors and 6 total predictors, the results of the power analysis showed that a minimum of 137 participants would be needed to achieve an appropriate power level for the study.

As recommended by Krieglmeyer and Deutsch (2010) incorrect responses for the manikin task were excluded from the analysis in the sample (20.55%). Responses over 1500 milliseconds were removed (3.56%), as well as responses below 150 milliseconds (0.04%).

As suggested by Lachaud and Renaud (2011) the causes of missingness in the data were analyzed, with the highest percentage of missing data appearing in the first part of each manikin task due to incorrect response. Apart from that, the distribution of missing data is even around all other trials of the test. This leads to the conclusion that the data is missing at random, but not completely at random.

In order to compute the results of both versions of the IAT (good//bad; lazy/motivated) the DW-score was calculated following the recommendations provided by Richetin, Costantini, Perugini, and Schönbrodt (2015) and supported by Chevance, Héraud, Guerrieri, Rebar, and Boiché (2017) were followed, in which the 10% fastest and slowest responses were replaced by the last untrimmed response, then the difference between the average response time of the practice and test block together were divided by the pooled SD of all the response times, and finally the score was computed based on practice and critical trials combined.

To test the relationship between stigma and behaviors moderation models, nine multivariate regression models were run with the different forms of stigma as independent variables and the different behaviors as dependent variables.

7.1.3. Results

7.1.3.1. Preliminary analyses.

Results of the pilot study showed expected differences between the overweight and non-overweight image groups: $F(1, 284) = 557.5$, $p < 0.001$. However, there were also some difference within the non-overweight female images: $F(5, 66) = 10.24$, $p< 0.001$. The problematic image was eliminated, and the subsequent results showed no significant differences within that group: $F(5, 66) = 1.437$ $p = 0.22$. For symmetry one image was eliminated from every group and a total of 40 images were kept for the study.

A principal component analysis (PCA) with orthogonal rotation (varimax) was run on the 8 items of the moderation-test sample. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis with a KMO of 0.79 ('middling' according to Kaiser, 1974). All KMO values for individual items were > 0.70 which is above the acceptable limit of 0.5. Bartlett's test of sphericity, χ^2 (28) = 1372.63, $p < 0.001$, indicated that correlations between items were sufficiently large for PCA. An initial analysis was run to obtain

eigenvalues for each component of the data. Two components had eigenvalues over Kaiser's criterion of 1 and, in combination, explained 78% of the variance. The scree plot showed inflexions that justify retaining two components. The first component clustered items that represent facilitating intentions, while the second component clustered items related to harmful intentions.

Bivariate correlations were run for all the variables used in the study with the exception of reaction time, since it requires the action (approach/avoid) to provide any valuable information. As expected, both explicit and implicit attitudes were related to reflective intentions. Table 3 shows the means standard deviations and correlation coefficient of the variables.

Variables	Mean	SD	1	2	3	4
1.- Harmful intentions	1.25	0.49	-			
2.- Facilitating intentions	4.47	0.69	-0.26***	-		
3.- Implicit attitudes (good/bad)	0.51	0.31	-0.05***	0.11***	-	
4.- Implicit Stereotypes (Lazy/Motivated)	0.13	0.27	-0.06***	-0.04***	0.33***	-
5.- Explicit Anti-Fat Attitudes	3.39	1.01	0.07***	-0.02*	0.11***	0.11***

Table 3. Descriptive Statistics and Correlations Between Variables. NOTES: * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.01$.

An initial step-wise regression model was run to test the validity of the moderators. It used the dependent variables – reaction time, harmful intentions and facilitating intentions – as outcomes and the categorical moderators as predictors. The weight category of the stimulus, as well as the action were positive predictors of reaction time ($\beta = 0.11$, $p < 0.001$; $\beta = 0.12$, $p < 0.001$) and sex of the stimulus was not ($\beta = 0.04$, $p = 0.06$). The weight category of the stimulus, as well as the sex were also positive predictors of both harmful intentions ($\beta = 0.09$, $p < 0.001$; $\beta = -0.13$, $p < 0.001$) and facilitating intentions ($\beta = -0.18$, $p < 0.001$; $\beta = -0.07$, $p < 0.001$). Thus, the moderation variables for the manikin task were action and weight and for the reflective intentions were sex and weight.

7.1.3.2. Exploring the relationship between implicit/explicit stigma and automatic/reflective responses.

Response times for the manikin task were regressed on implicit attitudes with the weight category of the stimulus. The action as a moderator variable was significant overall $F(7, 7900) = 11.19$, $p < 0.001$ and explained 0.9% of the variance of the reaction time. The weight category of the stimulus as well as the action were positive predictors of reaction time ($\beta = 0.09$, $P < 0.01$; $\beta = 0.09$, $p < 0.01$). The two and three-way interactions between implicit attitudes, weight of target, and action, however, were not significant. The interaction between weight stigma and anti-fat attitudes was significant ($\beta = 0.22$, $p < 0.01$).

In the case of the model where implicit stereotypes were used as predictors of reaction time, the model was also significant, $F(7, 7614) = 7.71$, $p < 0.001$, and explained 0.6% of the variance of the reaction time (see Figure 8). Implicit stereotypes, the weight category of the stimulus, and the action were positive predictors of reaction time ($\beta = 0.19$, $p < 0.05$; $\beta = 0.08$, $p < 0.05$; $\beta = 0.08$, $p < 0.01$). The three-way interaction between implicit attitudes, weight of target, and action was also significant ($\beta = 0.41$, $p < 0.05$). Simple slope analysis reveals that the only significant slope is that of implicit stereotypes when the action is approach and the image is of an overweight person: $B=0.20$, $p < 0.05$.

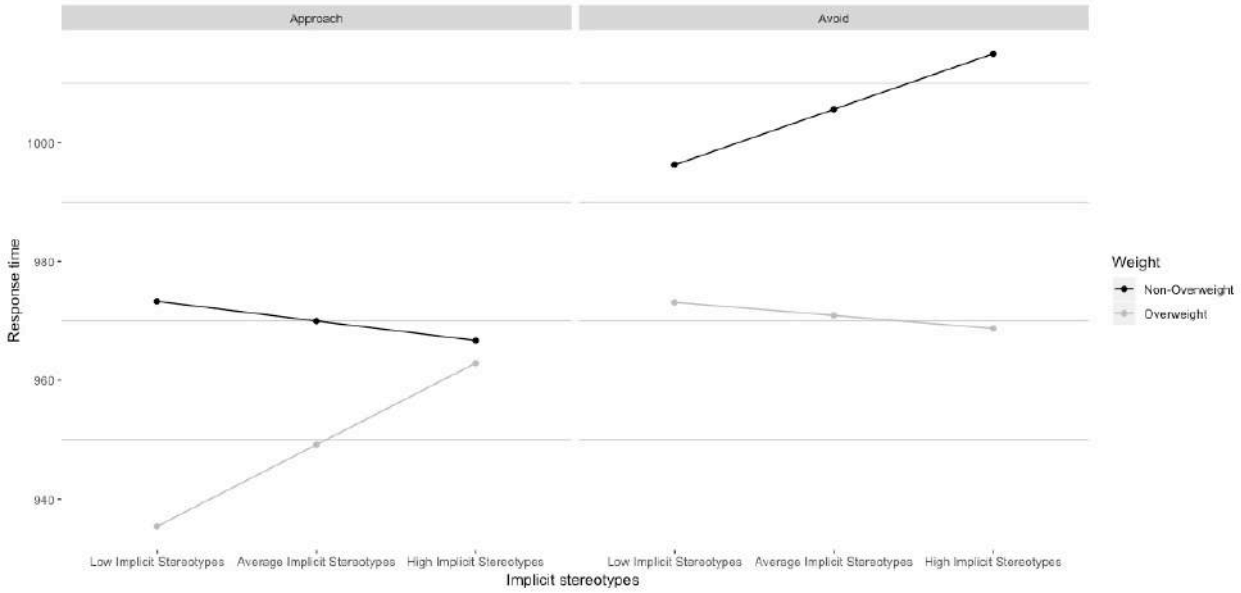


Figure 8. Impact of implicit stereotypes on response time as a function of (a) action and (b) weight of target.

Next, harmful intentions were regressed on explicit anti-fat attitudes with weight category of the stimulus (overweight/non-overweight) and the sex of the stimulus (male/female) as moderation variables. The overall model was significant $F(7, 12472) = 11.2$, $p < 0.001$, and explained 0.5% of the variance of the harmful intention score. Explicit attitudes were positively related to harmful intentions ($\beta = 0.07$, $p < 0.001$) and the weight category and sex of the stimulus were not. The three-way interaction between explicit attitudes, weight of target, and sex of target, however, was significant ($\beta = -0.10$, $p < 0.01$). Simple slope analysis reveals that the slope of explicit attitudes when the stimulus is male and the image is of an overweight person is significant: B = 0.07, $p < 0.001$, as well as the slope when the stimulus is male and the image is of a non-overweight person: B = 0.06, $p < 0.001$, and when the stimulus is female and the image is of an overweight person: B = 0.10, P < 0.001.

Then, facilitating intentions were regressed on explicit anti-fat attitudes with weight category of the stimulus (overweight/non-overweight) and the sex of the stimulus (male/female) as moderation variables. The overall model was significant $F(7,12792) =$

24.66, $p < 0.001$, and explained 1.3% of the variance of the facilitating intentions score (see Figure 9). The weight category of the stimulus was positively related to facilitating intentions ($\beta = -0.13$, $p < 0.001$). The three-way interaction between explicit attitudes, weight, and sex was significant ($\beta = 0.11$, $p < 0.001$) and is shown in Figure ten. Simple slope analysis reveals that the slope of explicit attitudes when the stimulus is male and the image is of a non-overweight person is significant: B = 0.05, $p < 0.001$, as well as the slope when the stimulus is female and the image is of an overweight person: B = -0.07, $p < 0.001$, and when the stimulus is female and the image is of a non-overweight person: B = 0.07, $p < 0.001$.

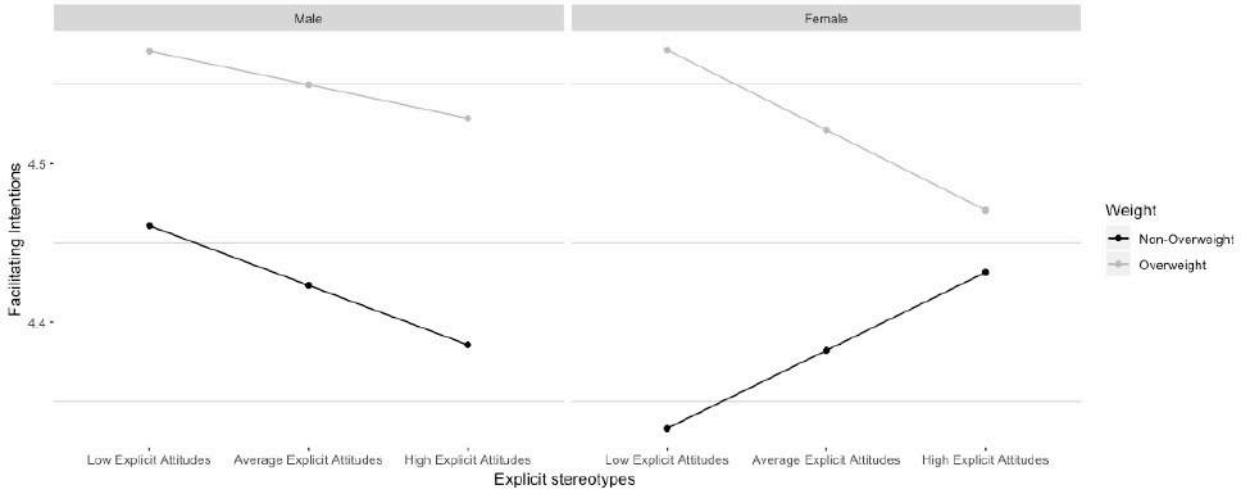


Figure 9. Impact of explicit attitudes on facilitating intentions as a function of (a) sex of target and (b) weight of target.

Next, we regressed harmful intentions on implicit attitudes (good/bad) with weight category of the stimulus (overweight/non-overweight), and the sex of the stimulus (male/female) as moderating variables. The overall model was significant, $F(7, 12632) = 15.01$, $p < 0.001$, and explained 0.7% of the variance of the harmful intentions (see Figure 10). The implicit attitudes score, and sex of the stimulus were positive predictors of harmful intentions ($\beta = 0.18$, $p < 0.001$; $\beta = -0.03$, $p < 0.01$), while the weight of the stimulus was not. The three-way interaction of implicit attitudes, weight, and sex of the stimulus was significant ($\beta = 0.11$, $p < 0.05$). With simple slope analysis, the slope of implicit attitudes

when the stimulus is male and the image is of a non-overweight person is significant: B = -0.21, $p < 0.001$, as well as when the stimulus is overweight: B = - 0.39, $p < 0.001$. The slope when the stimulus is female and the image is of a non-overweight person: B = 0.18, $p < 0.001$, and when the stimulus is overweight: B = -0.23, $p < 0.001$, are also significant.

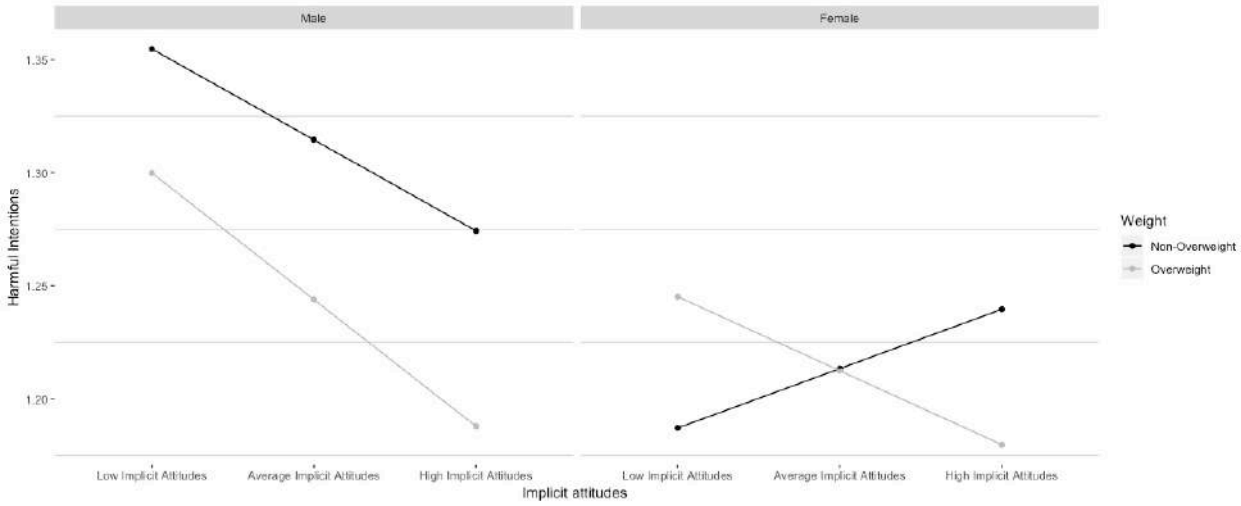


Figure 10. Impact of implicit attitudes on harmful intentions as a function of (a) sex of target and (b) weight of target.

Facilitating intentions were then regressed on implicit attitudes (good/bad) with weight category of the stimulus (overweight/non-overweight) and the sex of the stimulus (male/female) as moderation variables. The overall model was significant: $F(7, 12952) = 45.55$, $p < 0.001$, and explained 2.3% of the variance of the facilitating intentions. The implicit attitudes score, weight category, and sex of the stimulus were positive predictors of facilitating intentions ($\beta = 0.33$, $p < 0.001$; $\beta = -0.14$, $p < 0.001$; $\beta = 0.06$, $p < 0.001$). The highest order significant interaction was that of implicit attitudes with weight ($\beta = -0.23$, $p < 0.001$). Simple slope analysis reveals that both slopes are significant: B = 0.49, $p < 0.001$; B = 0.22, $p < 0.05$. The interaction between weight stigma and anti-fat attitudes was significant ($\beta = 0.22$, $p < 0.01$).

Harmful intentions were regressed on implicit stereotypes (lazy/motivated) with the weight category of the stimulus (overweight/non-overweight) and the sex (male/female) as

moderation variables. The overall model was significant: $F(7,12392) = 21.40$, $p < 0.001$, and explained 1.3% of the variance of the harmful intentions. The implicit stereotypes score, and sex of the stimulus were positive predictors of facilitating intentions ($\beta = -0.24$, $p < 0.001$; $\beta = -0.03$, $p < 0.01$) and the weight category of the stimulus was not. The highest order significant interaction was that of implicit attitudes with sex ($\beta = 0.18$, $p < 0.001$). Simple slope analysis reveals that the slope of the implicit attitudes when the stimulus is male is significant: $B = -0.55$, $p < 0.001$

Likewise, facilitating intentions were regressed on implicit stereotypes (lazy/motivated) with the weight category of the stimulus (overweight/non-overweight) and the sex (male/female) as moderation variables. The overall model was significant: $F(7,12752) = 23.33$, $p < 0.001$, and explained 1.2% of the variance of the facilitating intentions. The weight category and sex of the stimulus were positive predictors of facilitating intentions ($\beta = -0.12$, $p < 0.001$; $\beta = 0.05$, $p < 0.01$), and implicit attitudes was not. The three-way interaction of implicit stereotypes, weight and, sex of the stimulus was significant ($\beta = 0.52$, $p < 0.001$). Simple slope analysis reveals that both the slope of the implicit stereotypes when the stimulus is male and the image is of a non-overweight person: $B = -0.28$, $p < 0.001$, and when the stimulus is female and the image is of an overweight person: $B = -0.37$, $p < 0.001$, are significant.

Finally, reaction time was regressed on explicit attitudes, with the weight category of the stimulus (overweight/non-overweight) and the action (approach/avoid) as moderation variables. The overall model was significant $F(7, 7760) = 9.91$, $p < 0.001$ and explained 0.7% of the variance of the reaction time. The explicit attitudes score, action and, weight category of the stimulus were positively related to reaction time: ($\beta = -0.06$, $p < 0.01$; $\beta = 0.08$, $p < 0.01$; $\beta = 0.08$, $p < 0.01$). No interaction was significant

7.1.4. Discussion.

This study explored the relationship between implicit/explicit stigma and automatic behaviors or reflective intentions in exercise science students, while controlling for the moderating effects of weight and sex of the target. Previous studies had focused on the prevalence of implicit and explicit weight stigma in this population without looking at behavior (Alameda & Whitehead, 2015; Chambliss et al., 2004; Langdon et al., 2016). As expected, implicit measures relate to automatic behaviors and explicit and implicit attitudes/stereotypes relate to reflective intentions.

Interestingly, only implicit stereotypes are related to reaction time, while explicit attitudes and both implicit measures are related to reflective intentions. Sex and weight of target were important moderators for both explicit attitudes and implicit measures. Analyses showed that implicit attitudes and stereotypes were related to less harm for males, regardless of their weight, but more harm for non-overweight females in the case of attitudes. At the same time, explicit attitudes are related to more harm for males, irrespective of their weight, and more harm for females only if they are overweight. Implicit stereotypes on the other hand were related to less facilitation for non-overweight males and overweight females. Finally, explicit attitudes were related to less facilitation for non-overweight males and overweight females but more facilitation for non-overweight females.

A previous study found that exercise science professionals showed similar negative explicit attitudes for both sexes if they were overweight as compared to non-overweight youth (Peterson et al., 2012). Our results show that these attitudes are translated into reflective intentions that differ based on the sex of the target. For males there seems to be a strong relationship between explicit stigmatizing attitudes and negative reflective intentions irrespective of weight, while for females, this relationship is only present for overweight women.

Our results do not support previous findings of compensatory behaviors like the ones found in homophobia research (Cheval et al., 2016), where explicit forms of stigma are related to compensatory behavior expressed as an impulse approach tendency. The findings reported in this paper show no relationship between explicit attitudes and reaction time, regardless of the action (approach or avoid), while implicit stereotypes were related to a slower approach. On the other hand, implicit attitudes and stereotypes were related to positive reflective intentions, possibly as different form of compensatory behavior. This could be explained by the reflective/conscious nature of the behavior, which would imply that since reflective intentions are conscious, they are subject to control by the individual as a form of social desirability (Fisher, 1993) or social norms (Crandall et al., 2002). This has been previously observed when comparing implicit and explicit forms of stigma in exercise science students and professionals (Chambliss et al., 2004; Dimmock et al., 2009; Lynagh, Cliff, & Morgan, 2015; Readdy & Wallhead, 2016).

The previous body of literature had consistently found implicit and explicit forms of anti-fat bias in exercise science students and professionals (Chambliss et al., 2004; Peterson et al., 2012; Robertson & Vohora, 2008). It emphasizes, however, the need for efforts to evaluate the relationships between weight stigmatizing attitudes and behaviors. The present findings suggest that automatic behaviors might be related to implicit stereotypes while reflective intentions might be related to explicit attitudes. The study of these responses might be particularly useful in understanding the nuances involved the avoidance of exercise by higher weight individuals (Vartanian & Novak, 2011). It might also prove useful in reducing implicit forms of bias, as previous studies have explored (Berry, Elfeddali, & de Vries, 2014). Current findings also suggest that responses towards higher weight individual are highly dependent on sex and not only weight category.

It is possible, however, that these results are a result of unexplored gender biases. Further examination of gender biases and sex differences among participants are needed to confirm current findings in future research. Another limitation of this study is the recruitment strategy used. Participants were recruited as part of one of the classes of a single exercise science program, thus we cannot determine how representative this sample is as compared to other students of similar programs.

Understanding the way in which exercise science students and professionals deal with higher weight individuals is imperative for the promotion of physical activity. Weight bias is a barrier for its regular practice, whether by internalization or endorsement, and thus, we consider it especially important to bring attention to this issue.

Chapter 8: Are Weight Stigma Processes Diminishing Physical Activity in Those Who Are Targets of Stigma?

After having explored the prevalence of weight stigma in our current cultural environment, and subsequently in exercise science students the third question this thesis asks concerns the reactions to stigma that higher weight individuals have. Weight stigma processes have similar health related outcomes as has been presented in chapter 3. Weight bias internalization, stigma concerns and perceived discrimination have been shown to have diverse effects on physical activity (Pearl, Puhl, & Dovidio, 2015; Vartanian & Novak, 2011; Vartanian & Shaprow, 2008), The relationships of these processes and how they work with each other remains to be studied, as most research has investigated them separately.

There are two possible explanations for how these models work with each other: on the one hand, one may expect the three processes to act as three relatively independent pathways. This hypothesis rests on evidence that perceived discrimination and weight stigma internalization independently predict health-related outcomes (e.g., Pearl & Puhl, 2016; Pearl et al., 2015). For example, Pearl et al. (2015) observed that self-reported physical activity was negatively related to weight stigma internalization, but positively to perceived discrimination among women with overweight and obesity.

On the other hand, there are reasons to expect these processes to be related in a causal sequence, with perceived discrimination predicting weight stigma concerns, which in turn predicts weight stigma internalization. For example, Schmalz (2010) showed that the more people were concerned about being viewed by others in stereotypic terms (weight stigma concerns), the lower their perceived competence in physical activity. If poor perceived physical competence reflects weight stigma internalization (Pearl & Dovidio, 2015), this suggests that weight stigma concerns may predict weight stigma internalization. Other studies have shown that the relationship between perceived discrimination (discrimination) and

health-related outcomes is mediated by weight stigma internalization (Durso, Latner, & Hayashi, 2012; Hayward, Vartanian, & Pinkus, 2018; Pearl et al., 2015); whereas still others have shown that the relationship between perceived discrimination and health related outcomes is mediated by weight stigma concerns (Hunger & Major, 2015). In this model, the feeling of being stigmatized can predict the anticipation of future stigma which leads to weight stigma internalization.

If the assumption is made that both hypothetical models have a relationship between BMI and weight stigma processes that is mediated by perceived weight, i.e., the extent to which an individual perceives him or herself as overweight vs average weight or underweight, then they can be mapped together. Importantly, previous studies have also shown that "overweight/obese" social categories have vague boundaries (Major et al., 2014). This means that people may perceive themselves as overweight even if their weight does not fit the objective standards (i.e., BMI > 25) and, vice versa, people with obesity according to objective standards may not perceive themselves as such. Crucial, because unless one perceives oneself as overweight, weight bias internalization or weight stigma concerns will not occur, though perceived discrimination could.

Additionally, the idea that weight stigma processes predict physical activity through two motivational mechanisms: motivation to avoid exercise and self-control resources can be included in the models. This prediction rests on past research indicating that each weight stigma process is related to avoidance of stigmatizing activities (such as physical activity) (Vartanian & Novak, 2011; Vartanian & Shaprow, 2008), and to difficulties in self-regulation (i.e., to exert control on one's behaviors) (Hunger et al., 2015).

Specifically, self-control resources can be indexed by subjective vitality. Subjective vitality is the energy one can regulate for purposive actions (Ryan & Deci, 2008), and corresponds closely to the definition of self-control resources as the perceived mental

resources or energy available to the self (Clarkson, Otto, Hirt, & Egan, 2016). Several studies have confirmed that perceived subjective vitality may be a valid measure of self-control (Emile et al., 2015; Forestier et al., 2018).

8.1. Study 3: How do Weight Stigma Processes Relate to Each Other? A Comparison of Models in the Physical Activity Domain.

8.1.1. Objectives and hypothesis.

The main objectives of this study to compare two alternative models in which weight stigma process influence physical activity, a parallel one in which the processes are unrelated, and a serial one in which perceived discrimination predicts weight stigma concerns and concerns predict weight bias internalization. Testing the mediatory properties of motivation to avoid exercise and self-control on the relationship between stigma and physical activity was also a priority. The two competing models are represented in Figure 11.

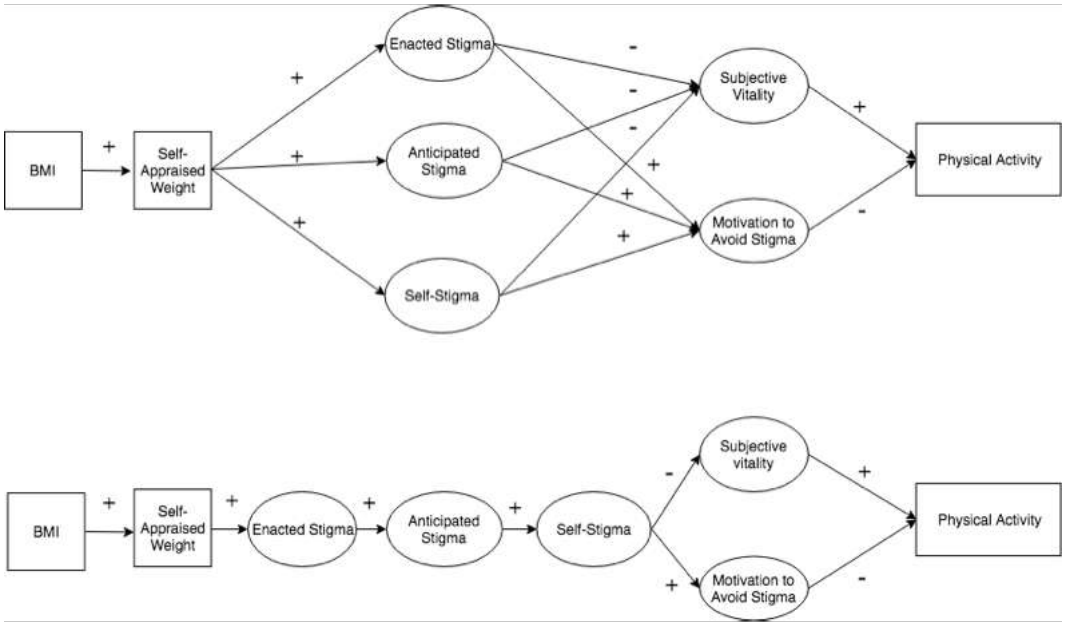


Figure 11. Visual representation of the parallel and serial hypotheses of weight stigma processes.

The second goal of this study was to examine the cultural invariance of weight stigma processes by testing our hypotheses in countries with different obesity prevalence: France and Mexico. France is ranked 27th in obesity prevalence out of the 45 countries in the Organization for Economic Co-operation and Development (OECD) (15.3% of the population), whereas Mexico is ranked second highest (32.4% of the population; (OECD, 2017). Given the exploratory nature of this comparison, we do not formulate a specific hypothesis. Nevertheless, there is no reason to think that the mechanisms (i.e., the relationships between the variables) may be different from one country to another. It is possible, however, that the level of weight stigma variables is lower in Mexico compared to France, because the prevalence of obesity is higher in this country; what some authors have called a visual normalization of obesity (Robinson, 2017).

8.1.2. Methods

8.1.2.1. Participants and procedure

In total, 552 people were contacted to participate in an anonymous on-line questionnaire between June and July 2016. A total of 417 people agreed to answer. They were recruited in France and Mexico thanks to hospitals, associations, and private practitioners that agreed to participate. A document explaining the goals of the study as an investigation of the psychosocial determinants of physical activity was sent to each site. They gave permission to recruit participants from among their patients and helped spread the questionnaire via e-mail and social media. All participants signed the study consent form approved by the Ethics Committee of the institution where the research was conducted. The questionnaire had an average duration of 19.5 minutes.

Outliers, underage participants, and those with substantial missing data were excluded (see Data screening section), yielding a final sample of 353 participants (200 French participants and 153 Mexican participants). Out of the French participants, 80 were males and

120 were female, and the sample had a mean age of 34.71 (*SD*=16.08). The Mexican sample was composed of 64 males and 89 females, with a mean sample age of 29.75 (*SD*=10.80).

8.1.2.2. Measures

Based on the transcultural validation methodology (Hambleton, 2005), the scales measuring perceived discrimination, weight stigma concerns, weight bias internalization, and exercise avoidance motivation, were translated from English to the concerned language by native speakers (French or Spanish) and back-translated by a professional translator to English, then both English versions were compared.

Perceived weight was assessed by asking participants to answer the question, "What do you think about your weight?" using seven possible answers, ranging from: 'very slim' to 'very overweight'. *Perceived discrimination* was assessed using a modified version of the everyday discrimination scale (Hunger & Major, 2015; Williams, Yan Yu, Jackson, & Anderson, 1997). The scale consists of five items (e.g., "In the past 12 months, how often have you been treated differently than others because of your weight?") rated on a scale ranging from 1 (never) to 7 (all the time) (α_{France}=.91; α_{Mexico}=.93). *Weight stigma concerns* was measured with the scale developed by Hunger and Major (Hunger & Major, 2015), which consists of three items (e.g., "I am afraid of being excluded because of my weight") rated on a Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) (α_{France}=.91; α_{Mexico}=.90). *Weight bias internalization* was measured with the Modified Weight Bias Internalization Scale *(WBIS-M*; Pearl & Puhl, 2014), which consists of 11 items (e.g., "I am less attractive than other people because of my weight") rated on a Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) (α_{France}=.91; α_{Mexico}=.91).

Motivation to avoid exercise was measured with a three-item measure (e.g., "I avoid going to the gym when I know there will be plenty of thin people there"; (Vartanian & Novak, 2011). For each item, participants responded on a seven-point scale from 1 (not at all)

to 7 (totally agree) (α_{France}=.81; α_{Mexico}=.73). *Subjective vitality* was measured using the Subjective Vitality Scale (Ryan & Frederick, 1997a), consisting of five items (e.g., "I feel alive and full of vitality") rated on a Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) (α_{France}=.92; α_{Mexico}=.90).

Physical activity was assessed with the short-form of the International Physical Activity Questionnaire (IPAQ; Booth, 2000). Participants were asked to report the amount of moderate (e.g. biking calmly, doubles tennis match) and vigorous (e.g. mountain cycling, playing football, long distance running) physical activity they engaged in, indicating for each category how many days in the last seven days they engaged in such activities, and how much time they usually spent in those activities per day. Frequency and duration were multiplied to obtain an average of total minutes of moderate to vigorous physical activity (MVPA) per week.

Finally, the questionnaire included a demographic section in which participants reported their height and weight, allowing us to calculate their BMI.

8.1.2.3. Data analysis strategy

Structural equations modeling (SEM) was the main analysis strategy of the data. To ensure that the underlying assumptions of SEM were met, participants were screened for missing data and outliers. Then, univariate histograms, skewness, and kurtosis scores were used to check for normality. Next, measurement invariance of the questionnaire across the two countries was tested to ensure that items functioned similarly across cultural contexts. We followed a previously recommended procedure (Millsap, 2011) by conducting hierarchical tests for invariance of measurement parameters. We first carried out a confirmatory factor analysis (CFA) to check for the expected relationships between each item and their subscale (factor), with all cross-loadings constrained to zero. This model was taken as the configural model and was used as the baseline model for the test of factor loadings

(metric) invariance, and the factor loadings plus intercepts (scalar) invariance. Model fit was determined by comparing multiple fit indices (Hu & Bentler, 1999): the χ^2, the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA). CFI and TLI values over 0.90 and RMSEA below 0.08 are considered as indicators of acceptable fit (Hair, Black, Babin, & Anderson, 2010). To test the different types of invariance, we looked for changes in fit across the nested models of .015 or less for RMSEA (ΔRMSEA) and of .01 or less for CFI (ΔCFI) to establish invariance (Cheung & Rensvold, 2002).

SEM was then used to test the two competing structural models presented above. The goodness-of-fit indices, completed by the Akaike information criterion (AIC), the Bayes information criterion (BIC) and the chi square difference between the two models (Schreiber, Nora, Stage, Barlow, & King, 2006), were used to identify the best model. For AIC and BIC, the smaller the index are, the better the model is. Indirect effect was computed using bootstrapping (1,000 bootstrapped samples) procedures with 95% confidence intervals determining the indirect (mediated) relationships between models' variables. Finally, a multigroup SEM was run to test the invariance of the best model within the French and Mexican samples. Specifically, the fits of models with constrained structural paths across groups were compared to those of an unrestricted model in which the structural paths were allowed to vary across the two countries. If the fit of the model degraded significantly, this was evidence that the relationships between the variables of the model differed significantly by country.

R-studio and its package LAVAAN (Rosseel, 2012) were used for all the analyses described in this section.

8.1.3. Results

8.1.3.1. Data screening

We excluded from analyses participants who were under 18 years old (France=2; Mexico=6) or who had over 70% of missing data (France=25; Mexico=18). Outliers were handled via the Mahalanobis distance with a critical chi-squared value of 24.32 assessed using a $p<.001$, which resulted in seven participants being eliminated from the French sample and six from the Mexican one, leaving 353 participants in the final sample. To ensure the additional missing data were missing at random the distribution by question was estimated. Forty-five participants had 1.15% missing data and eight participants had 2.3% missing data. Data were missing over 15 different questions, indicating that they were completely at random Multivariate imputation by chained equations was used to impute the rest of the missing data (Buuren & Groothuis-Oudshoorn, 2011). All measured variables had a skewness and kurtosis below 1.0 and were distributed normally.

The average BMI for the combined sample is 24.33 (*SD*=4.91) with 4.25% of participants being underweight, 61.19% within normal weight, 22.66% overweight and 11.90% obese, according to the weight categories determined by the Center for Disease Control (2016). The average BMI in the Mexican sample was 25.34, which is in the overweight range, while the average BMI in the French sample was 23.55, which is within the normal range. This coincides with the underlying populations of Mexico and France (Kuri Morales et al., 2016; Saint Pol, 2007). Bonferroni corrected t-tests for intergroup comparisons in all measured variables revealed no significant differences between the two countries, except for BMI and perceived discrimination, which were higher in the Mexican sample. Independent sample characteristics the two countries (sex, BMI, age, and scores) can be found in the Table 1 of the supplemental materials of study 3, in the annexes.

8.1.3.2. Measurement model

Results from the CFA indicated that the model fits the data correctly [$\chi^2(314)$= 871.39, CFI= 0.922, TLI= 0.913, RMSEA= 0.071, CI=0.065-0.077]. Due to a low and non-significant factor loading we decided to remove the first item of the WBIS-M scale. Moreover, based on the Lagrange multiplier (LM) test, we added covariance relationships within two perceived discrimination items and two weight bias internalization items. This re-specified model improved the fits of the data in the pooled sample [$\chi^2(287)$= 780.36, CFI=0.931, TLI=0.922, RMSEA=0.070, CI=0.064-0.076], the French [$\chi^2(287)$=637.30, CFI=0.914, TLI=0.903, RMSEA=0.078, CI=0.070-0.086] or Mexican [$\chi^2(287)$= 492.33, CFI=0.995, TLI=0.916, RMSEA=0.068, CI=0.058-0.079] sub-samples as well. As a result, it was used as baseline (configural) model. Means, standard deviations, Cronbach's alpha and correlation matrix of the variables of interest can also be found in the Table 4 of the supplemental materials of study 3 in the annexes.

Compared to the configural model, the changes in fit for the metric model (loadings constrained across countries) exceeded the requirements for invariance on the CFI statistic (ΔCFI=0.014 and ΔRMSEA=0.005). The constraint of equal loading across countries had to be relaxed for the eighth item of the WBIS-M scale to attain partial metric invariance (ΔCFI=0.007 and ΔRMSEA=0.002). Compared to the metric model, the scalar model did not worsen the fit to the data (ΔCFI=0.006 and ΔRMSEA=0.001), thus showing partial scalar invariance across countries given that the item 8 of the WBIS-M scale has to be unconstrained in the preceding model (i.e., metric invariance model). Table 4 shows the goodness of fit indices for all models tested

	df	$\chi 2$	CFI	ΔCFI	TLI	RMSEA	CI RMSEA	ΔRMSEA
Configural invariance	574	1129.62	0.919	NA	0.908	0.074	0.067-0.081	NA
Metric invariance	594	1195.40	0.912	0.007	0.904	0.076	0.070-0.082	0.002
Partial metric invariance	615	1258.14	0.906	0.006	0.901	0.077	0.070-0.083	0.001
Scalar invariance	638	1351.07	0.896	0.010	0.894	0.080	0.074-0.086	0.003
Model invariance								
Free betas	736	1446.12	0.904	NA	0.893	0.074	0.068-0.080	NA
Constrained betas	764	1516.63	0.898	0.006	0.891	0.075	0.070-0.080	0.001

Table 4. Factorial invariance tests across countries for the measurement model.

Note: df: degrees of freedom; CFI: Comparative fit index; TLI: Tucker-Lewis Index; RMSEA: Root mean square error; CI: Confidence interval; NA: Not Applicable

8.1.3.3. Comparison of structural models[1]

The parallel processes model [$\chi^2(366)=1283.56$, CFI=0.88, TLI=0.87, RMSEA=0.085, CI=0.080-0.090, AIC=33011, BIC=33321] showed worse fit indexes than the serial processes model [$\chi^2(370)=1072.84$, CFI=0.91, TLI=0.90, RMSEA=0.073, CI=0.068-0.079, AIC=32802, BIC=33049]. However, the modification indices of the parallel processes model suggested to add two paths, namely perceived discrimination → weight stigma concerns → weight bias internalization. This revised parallel processes model resulted in a substantial improvement in the fit of the model to the data [$\chi^2(364)=1002.33$, CFI=0.92, TLI=0.91, RMSEA=0.071, CI=0.065-0.076, AIC=32743, BIC=33014; $\Delta\chi2 = 281.23$, $\Delta df = 2$, $p < 0.001$]. All the paths but four (those linking perceived discrimination and weight stigma concerns on the one hand to subjective vitality and motivation to avoid PA on the other hand) were significant and in the expected direction. In addition, the modification indexes of the serial model also suggested to add two paths, namely perceived weight → weight stigma concerns and perceived weight → weight bias internalization. This revised serial model resulted in an improvement in the fit of the model to the data [$\chi^2(368)=1009.56$, CFI=0.92, TLI=0.91, RMSEA=0.070, CI=0.065-0.076, AIC=32742, BIC=32997; $\Delta\chi2 = 63.28$, $\Delta df = 2$, $p < 0.001$]. All the paths were significant and in the expected direction.

Ultimately, the two modified models are close, the only differences concern the 4 non-significant paths of the parallel processes model. Comparison of the two modified models fit indices showed marginal difference [$\Delta\chi^2(4)=7.23$, p=.124; ΔAIC=1, ΔBIC=17] in favor of the most parsimonious model – i.e., the modified serial processes model – that should be preferred.

This model is a combination between the serial and parallel model (see Figure 12), where perceived weight mediates the relationships between BMI and the three weight stigma (as expected in the parallel processes model), then these later are related in a serial manner

Perceived Discrimination → Weight Stigma Concerns → Weight Bias Internalization (as assumed by the serial processes model). In turn, Weight Bias Internalization (but not the two other weight stigma) predicts PA through subjective vitality and motivation to avoid exercise (as assumed by the serial processes model). This model explains between 10 and 62% of the variance of the variables. The standardized path coefficients for the final model are shown in Figure 2.

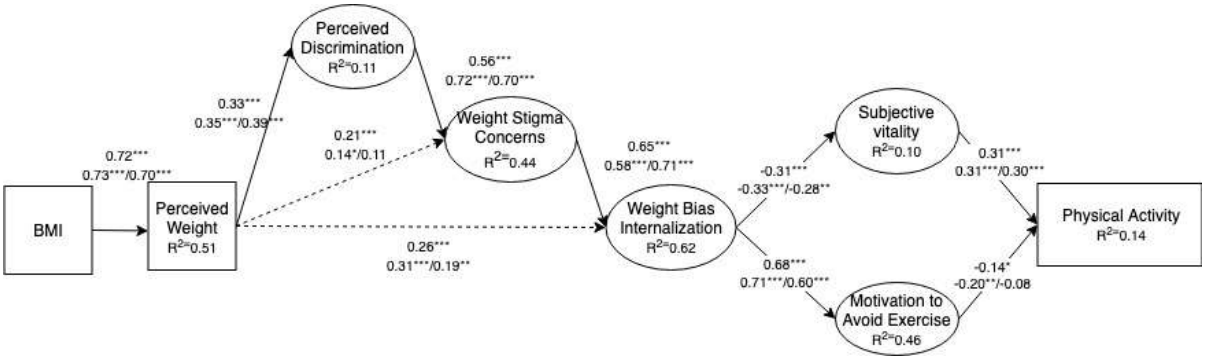


Figure 12. Mechanisms underlying weight stigma and physical activity relationship.

Note: Dotted lines between constructs indicate direct paths suggested via modification indices. The path coefficients of the structural model which can be interpreted as standardized beta weights in a regression model are shown next to each arrow. The top one is for the combined sample, bottom left represents France, and bottom right represents Mexico

*P<0.05, **P<0.01, ***P<0.001.

8.1.3.4. Indirect effects

The results indicate that BMI has a negative indirect effect over PA [B = −3.29; β = −0.07; 95% CI = -0.10, -0.04; $p < 0.001$], whereas it had a negative indirect effect on subjective vitality [B = −0.01; β = −0.03; 95% CI = -0.04, -0.01; $p < 0.001$] and a positive indirect effect on motivation to avoid exercise [B = 0.01; β = 0.06; 95% CI = 0.04, 0.08; $p < 0.001$]. Perceived weight also had a negative indirect effect over physical activity [B = -16.15; β = -0.10; 95% CI = -0.15, -0.06; $p < 0.001$] by indirectly reducing subjective vitality [B = -0.03; β = -0.04; 95% CI = -0.06, -0.02; $p < 0.001$] and increasing motivation to avoid

exercise [B = -0.03; β = -0.04; 95% CI = -0.06, -0.02; $p < 0.001$]. Perceived discrimination [B = -17.51; β = -0.07; 95% CI = -0.10, -0.04; $p < 0.001$], weight stigma concerns [B = -21.79; β = -0.13; 95% CI = -0.18, -0.07; $p < 0.001$], and weight bias internalization [B = -30.07; β = -0.20; 95% CI = -0.27, -0.12; $p < 0.001$] also showed significant indirect effects over the reduction of physical activity. The standardized parameter estimates of indirect effects along with their 95% lower and upper limits of bootstrapped-generated bias-corrected confidence intervals are presented in Table 5.

Parameters	β	95% CI	
		LL	UL
BMI→PW→PD→WSC→WBI→SV→PA	-0.01***	-0.01	-0.004
BMI→PW→PD→WSC→WBI→SV	-0.03***	-0.04	-0.01
BMI→PW→PD→WSC→WBI	0.09***	0.06	0.12
BMI→PW→PD→WSC	0.13***	0.09	0.18
BMI→PW→PD	0.24***	0.17	0.31
BMI→PW→PD→WSC→WBI→MAvE→PA	-0.01*	-0.02	-0.001
BMI→PW→PD→WSC→WBI→MAvE	0.06***	0.04	0.08
BMI→PW→WSC→WBI→SV→PA	-0.01**	-0.02	-0.003
BMI→PW→WSC→WBI→SV	-0.03***	-0.05	-0.01
BMI→PW→WSC→WBI	0.10***	0.06	0.14
BMI→PW→WSC	0.15***	0.09	0.22
BMI→PW→WSC→WBI→MAvE→PA	-0.01*	-0.02	-0.001
BMI→PW→WSC→WBI→MAvE	0.07***	0.04	0.10
BMI→PW→WBI→SV→PA	-0.02***	-0.03	-0.01
BMI→PW→WBI→SV	-0.06***	-0.08	-0.03
BMI→PW→WBI	0.19***	0.13	0.24
BMI→PW→WBI→MAvE→PA	-0.02*	-0.03	0.003
BMI→PW→WBI→MAvE	0.13***	0.08	0.17
PW→PD→WSC→WBI→SV→PA	-0.01***	-0.02	-0.005
PW→PD→WSC→WBI→SV	-0.04***	-0.06	-0.02
PW→PD→WSC→WBI	0.12***	0.08	0.16
PW→PD→WSC	0.19***	0.13	0.25
PW→PD→WSC→WBI→MAvE→PA	-0.01*	-0.02	-0.002
PW→PD→WSC→WBI→MAvE	0.08***	0.05	0.11
PW→WSC→WBI→SV→PA	-0.01**	-0.02	-0.005
PW→WSC→WBI→SV	-0.04***	-0.07	-0.02
PW→WSC→WBI	0.14***	0.08	0.20
PW→WSC→WBI→ MAvE→PA	-0.01*	-0.03	-0.002
PW→WSC→WBI→ MAvE	0.09***	0.05	0.14
PW→WBI→SV→PA	-0.03***	-0.04	-0.01
PW→WBI→SV	-0.08***	-0.12	-0.04
PW→WBI→MAvE→PA	-0.03*	-0.05	-0.005
PW→WBI→MAvE	0.17***	0.12	0.23
PD→WSC→WBI→ SV→PA	-0.04***	-0.05	-0.02
PD→WSC→WBI→ SV	-0.11***	-0.16	-0.07
PD→WSC→WBI	0.36***	0.30	0.43
PD→WSC→WBI→MAvE→PA	-0.04*	-0.06	-0.01
PD→WSC→WBI→MAvE	0.25***	0.19	0.30
WSC→WBI→SV→PA	-0.06***	-0.09	-0.03
WSC→WBI→SV	-0.20***	-0.27	-0.13
WSC→WBI→ MAvE→PA	-0.06*	-0.11	-0.01
WSC→WBI→ MAvE	0.44***	0.37	0.51
WBI→SV→PA	-0.10***	-0.14	-0.05
WBI→ MAvE→PA	-0.10**	-0.17	-0.02
BMI→ PA	-0.07***	-0.10	-0.04
PW→ PA	-0.10***	-0.15	-0.06
PD→ PA	-0.07***	-0.10	-0.04
WC→ PA	-0.13***	-0.18	-0.07
BI→ PA	-0.20***	-0.27	-0.12

Table 5. Standardized parameter estimates of indirect effects model.

*Notes: BMI=Body Mass Index, PW= Perceived Weight, PD= Perceived Discrimination, WSC= Weight Stigma Concerns, WBI= Weight Bias Internalization, SV= Subjective Vitality, MAvE=Motivation to Avoid Exercise , PA= Physical Activity, β = standardized parameter estimate; 95% CI = 95% confidence intervals of parameter estimates; LL = Lower limit of 95% CI; UL = Upper limit of 95% CI; BMI = Body Mass Index. *p<.05, **p<.01, ***p<.001.*

Two specific indirect effects are of importance to understand the functioning of weight stigma processes in relation to physical activity: (a) via subjective vitality; (b) via motivation to avoid exercise. Results showed that the specific indirect effect of BMI on PA via subjective vitality [B = -0.39; β = -0.01; 95% CI = -0.01, -0.004; $p < 0.001$] produced similar results to that of BMI on PA via motivation to avoid exercise [B = -0.39; β = -0.01; 95% CI = -0.02, -0.001; $p < 0.001$].

8.1.3.5. Cultural invariance of the serial model

In order to test for cross-cultural invariance of the serial processes model we ran two multigroup models, one where the structural paths were allowed to vary across the two countries, and another with the loadings constrained but with the same item freed as in the measurement invariance test. Both models show satisfactory (Table 4, last two lines) and comparable fits (ΔCFI=0.006 and ΔRMSEA=0.001). This result indicates that the regression coefficients could be held equal across the country, indicating a similarity in the way the predictors influence the outcome variables across both countries.

8.1.4. Discussion

Physical activity has been shown to have irrefutable benefits for overall health, especially for obese individuals, and even without weight loss (Lee et al., 2005; Warburton et al., 2006). Nevertheless weight stigma can hinder the practice of physical activity and might even be driving the so-called obesity epidemic and harming the health of obese individuals

(Tomiyama et al., 2018). While prior research has investigated the health-related correlates of perceived discrimination, weight bias internalization, and weight stigma concerns, these processes have, for the most part, been examined separately. The potential interdependence of these processes is highly relevant in understanding how stigma affects PA. The main hypotheses of the way these weight stigma processes are related to PA is represented in parallel and serial processes. In the tested serial model, perceived discrimination predicted weight stigma concerns, which predicted internalization of weight stigma. Whereas in the parallel model, each process was independent and additive.

The first goal of the present study was to compare these two hypotheses. Results indicated that the serial processes model had a better fit to the data than the parallel one. This means that the more frequently participants reported experiencing discrimination, the more concerned they were about being targets of discrimination in the future. Furthermore, the higher their concerns, the more they blamed themselves and accepted negative weight-based stereotypes. These results are in line with prior research indicating that the relationship between discrimination and health-related outcomes is mediated by weight bias internalization (Durso et al., 2012; Hayward et al., 2018; Pearl et al., 2015) or weight stigma concerns (Hunger & Major, 2015), and that weight stigma concerns predicts weight bias internalization (Schmalz, 2010). However, these results build on those studies by showing that these three processes act within a chain of mechanisms.

In the final model we hypothesized that each stigma process served as a mediator for the next, as well as for the final relationship between BMI and physical activity. All the direct pathways of the model, as well as the indirect one's going from BMI to physical activity were significant in the expected directions. This provides further proof of the serial nature of weight stigma processes, as well as highlights the importance of perceived self-control, as operationalized by subjective vitality in mediating the relationship between stigma and

physical activity. This results support previous findings of the same association (Forestier et al., 2018).

Results concerning mediation showed that both motivation to avoid exercise and subjective vitality mediated the relationship between weight bias internalization and physical activity. In other words, the more participants internalized weight stigma, the lower their subjective vitality, and the higher their motivation to avoid exercise, resulting in lower physical activity. This corroborates previous research showing significant relationships between perceived discrimination with motivation to avoid exercise and inhibitory control (Araiza & Wellman, 2017), and between motivation to avoid exercise and physical activity (Vartanian & Novak, 2011; Vartanian & Shaprow, 2008). The present study expands on previous findings by showing that subjective vitality is an independent mediator of the relationships between weight bias internalization and PA, whereas previous studies have studied them separately.

Highlighting the serial nature of the weight stigma processes is this important because it changes it could potentially change the approach of physical activity interventions. It implies that previous experiences with discrimination could set off a chain of psychological processes that ends up reducing physical activity. It is important to note however that the scale used to measure perceived discrimination is limited to face-to-face interaction, ignoring the media and the societal weight stigma that permits and exacerbates anti-fat cultural norms.

The second goal of the study was to examine cultural invariance of weight stigma processes in two countries with different obesity prevalence (France and Mexico). Preliminary analyzes showed significant differences between the BMI of each country but not between perceived weight. If the higher average BMI in Mexico than in France is consistent with previous studies (Kuri Morales et al., 2016; Saint Pol, 2007), it is interesting to note that Mexican participants do not feel on average larger than French participants. This result can be

explained by the visual normalization theory (Robinson, 2017). This theory holds that weight status is judged according to visual body size norms. When larger body sizes are common, there is a recalibration of what is perceived to be a 'normal' or 'overweight' body sizes. In other words, an increased exposure to obesity (like in Mexico) can entail an increase in size at which a body is categorized as normal or overweight. While this process may potentially lead to an under-detection of overweight and obesity (Robinson, 2017), our results showed that it doesn't seem to have an effect on the weight stigma processes. Indeed, we found that the serial processes model was cross-cultural invariant. In other words, the process in which stigma affects physical activity through motivational variables does not differ throughout the countries, regardless of the difference in obesity prevalence.

Furthermore, both samples were partially invariant in measurement as the scale used measured the same latent constructs in both countries. The structure of the model resulted in acceptable fit indices regardless of the difference in BMI between the samples. This could indicate that the anti-fat norms prevailing in the northern countries (Brewis, SturtzSreetharan, & Wutich, 2018) are at least partially as psychologically damaging in other countries.

As expected, perceived weight mediated the relationship between BMI and perceived discrimination, providing support for the hypothesis that actual weight is less important for the perception of stigma than the self-appraisal of one's actual weight (Major et al., 2014). Other studies have also highlighted the importance of comparing BMI against perceived weight since it has important implications for the way in which we measure weight and stigma in future research (Seacat & Mickelson, 2009).

The present study adds to the existing literature in several ways. First, by providing empirical evidence for previously proposed theoretical models (Major et al., 2014, 2018), second, by permitting a whole-picture view of the different processes of weight stigma within two populations with widely different prevalence of obesity (France and Mexico), third, by

showing the cross-cultural invariance of these processes.

Understanding the underlying processes by which weight stigma affects physical activity offers an opportunity to not only develop future experimental research but also process centered interventions. Given the cross-sectional nature of the study, the relationships between the variables cannot be deemed causal; thus, further studies should look to experimentally manipulate the variables proposed in this model. It is also worth mention that not everyone who internalizes weight bias has necessarily perceived discrimination in a direct form. Media exposure for example has been identified as a source of stigma (Latner et al., 2007), and body image concerns (Fardouly & Vartanian, 2015, 2016). Thus, a contextual influence unexplored in the current study could provide an alternative pathway to internalization.

Further studies should also investigate interventions focused on internalized factors and concerns for stigma and their effect on physical activity as mediated by self-control and motivation to avoid exercise.

8.2. Study 4: Self-Control Resources, Motivation to Avoid Exercise and Weight Stigma Concerns in a 16-week Physical Activity Program for Individuals with Obesity

As results in the previous study show, weight stigma processes seem to have an overall negative impact over the practice of physical activity. This effect however is mediated by self-control resources and motivation to avoid exercise. Ego depletion, that is, the depletion of self-control resources necessary to control one's behaviors, has been shown to be an effective predictor of physical activity and health behaviors (Emile et al., 2015; Forestier et al., 2018). These effects however have seldomly been explored in the sigma literature, with objectively measured physical activity, and in a longitudinal manner.

Previous studies have hypothesized that stigma avoidance and impaired self-control could explain low levels of physical activity (Major, Tomiyama, & Hunger, 2018). In the case of weight stigma, engaging in regular physical activity would require self-control resources to override the weight stigma concerns, leading to increased ego depletion or avoidance of exercise (Vartanian & Novak, 2011).

8.2.1. Objectives and hypothesis.

The main objective of this study was to explore the moderating or mediating roles of self-control and motivation to avoid exercise on the relationship between weight stigma concerns and various levels of physical activity. It did so to further explore the results observed in the previous study in a longitudinal manner.

Previous studies have shown that being exposed to stereotypes can impact self-control resources in a negative way, causing ego depletion (Emile et al., 2015; Inzlicht & Kang, 2010). Of special interest to us however was the anticipation of stigma, since it has been shown to be related to motivation to avoid exercise (Vartanian & Novak, 2011; Vartanian & Shaprow, 2008).

Specifically, we hypothesized that higher weight stigma concerns coupled with high motivation to avoid exercise would result in lower levels of overall physical activity, while higher self-control would lead to increased levels.

Overall, this study is likely to extend the literature in at least three important ways: (a) by clarifying the relationship between weight stigma concerns, self-control and motivation to avoid exercise; (b) by exploring previous finding relating weight stigma to motivation to avoid exercise using objectively measured BMI and physical activity; and (c) by exploring this relationships in a longitudinal manner, across 16-weeks.

8.2.2. Methods.

8.2.2.1. Participants and procedure.

Participants belong to the Sport4Health international study, which recruited participants being treated for sleep apnea to participate in a physical activity program with a duration of 16 weeks. The program aimed to increase physical activity practice in a population of patients diagnosed with sleep apnea. 58 participants with BMIs over 25 (53 male, 5 females; M_{age}= 58.65, SD= 9.13) met the eligibility criteria and participated voluntarily. Users were provided access to an app or website (depending on accessibility). When connected to the app, the patient had access to his/her sport prescription and was able to enroll in a dedicated sport session. The app also drives the patient to complete some measurements and fill in online questionnaires. The patient can also get feedback on his/her activities from the app. Initially they completed a questionnaire assessing stigma concerns, motivation to avoid stigma, and subjective vitality and provided some demographic information. Other measured like sleep quality and blood pressure were collected but not analyzed in this study, the first measures were repeated three more times, two times during the 16-week program and once at the end. Participants were also evaluated by a physician who provided the BMI of the participants. During the 16 weeks, participants' physical

activity was tracked using an accelerometer they carried everywhere they went. Data was captured by Viseo, who developed the app and the Centre Hospitalier Universitaire de Grenoble. The role of the first author of this study only analyzed the data.

8.2.2.2. Measures.

Physical activity was measured using the Actigraph GT3X monitor device. It collects motion data on 3 axes: vertical (Y), horizontal right-left (X) and horizontal front-back (Z), and was picked because of previous validation and robustness of measurement (Santos-Lozano et al., 2013).

The scale developed by Hunger and Major (2015) was used to measure *weight stigma concerns*. It consists of three items (e.g., "I am afraid of being excluded because of my weight") rated on a Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) (α in Table 6).

The *Subjective Vitality* Scale (Ryan & Frederick, 1997b) was used. It consists of five items (e.g., "I feel alive and full of vitality") rated on a Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) (α in Table 6).

Motivation to avoid stigma was measured using the three-item measure (e.g., "I avoid going to the gym when I know there will be plenty of thin people there") used by Vartanian and Novak (2011). For each item, participants responded on a seven-point scale from 1 (not at all) to 7 (totally agree) (α in Table 6).

8.2.2.3 Data analysis.

Hierarchical linear modeling (HLM) was used to analyze the data since it involved a nested structure data set with between-subject variables (time) and within subject variables (see measures). HLM is a statistical analysis approach that allows for the evaluation of between-individual differences and intra-individual changes over time. HLM accounts for the

shared variance by multiple observations within the same participant and thus, it makes it an appropriate technique for the present study.

Three sets of models were tested in order to take advantage of the sensitivity of the physical activity measurement. In these sets the dependent variable was the only variation with the first model testing vigorous PA, the second model testing moderate PA, and the third one testing light PA. For all sets an unconditional growth model was the first model tested to estimate the average, as well as the individual differences in intercept and growth trajectory. This is to say that the first model analyzed change of individuals' physical activity score over time without other conditions. The random effect of both the intercept and the linear slopes were included in the model.

The second model of each set estimated the effects of weight stigma concerns on physical activity as mediated by motivation to avoid exercise and subjective vitality. All predictors were centered at the sample mean (i.e., grand mean centering).

The third model of each set estimated the effect of weight stigma concerns on physical activity as moderated by motivation to avoid exercise and subjective vitality. All predictors were centered at the sample mean (i.e., grand mean centering).

8.2.3. Results.

The means, standard deviations, and Cronbach's alpha of each variable at each measurement time is reported in Table 6 as well as means, standard deviations, and bivariate correlations.

Variables	Time 0			Time 1			Time 2			Time 3			
	mean	std.dev	Alpha	mean	std.dev	Alpha	mean	std.dev	Alpha	mean	std.dev	Alpha	ICC
BMI	30.7	2.65	-	-	-	-	-	-	-	30.26	2.86	-	0.84
Vigorous Physical Activity	3.56	17.52	-	5.54	27.36	-	11.79	50.08	-	14.85	84.81	-	0.45
Moderate Physical Activity	166.03	217.87	-	245.55	410.15	-	347.25	456.6	-	266.18	314.15	-	0.55
Light Physical Activity	1957.72	1655.15	-	2880.61	2272.35	-	3601.23	2355.27	-	3250.6	1946.69	-	0.39
Weight Stigma Concerns	2.25	1.57	0.93	2.54	1.38	0.89	2.65	1.36	0.9	2.71	1.63	0.88	0.54
Subjective Vitality	4.45	1.05	0.69	4.89	1.03	0.79	4.98	0.81	0.69	5.03	0.93	0.67	0.54
Motivation to Avoid Stigma	2.83	1.5	0.77	2.98	1.59	0.81	2.32	1.57	0.92	2.9	1.82	0.82	0.68

Table 6. Means, standard deviations, Cronbach's alpha coefficients, and intraclass correlation coefficients of all variables.

In the light and moderate levels of physical activity there was a significant linear effect of time on PA. This indicated a significant change of physical activity over time without accounting for other variables. Vigorous physical activity did not change and its mean remained below 15 minutes a month throughout the entire process. The casual steps strategy was used to test the mediation potential of self-control and motivation to avoid exercise on the relationship between weights stigma concerns and physical activity (Baron & Kenny, 1986). Weight stigma concerns was not significantly related to vigorous ($B = 0.06$, $p = 0.98$), moderate ($B = 40.43$, $p = 0.07$), light physical activity ($B = 127.89$, $p = 0.38$), or subjective vitality ($B = 0.04$, $p = 0.50$) independent from interactions. It was related however, to motivation to avoid exercise ($B = 0.41$, $p < 0.001$). Neither subjective vitality nor motivation to avoid exercise were related to light ($B = 2.19$, $p = 0.64$; $B = -2.79$, $p = 0.36$), moderate ($B = 55.91$, $p = 0.11$; $B = -9.01$, $p = 0.72$;), or vigorous physical activity ($B = 389.24$, $p = 0.07$; $B = 167.90$, $p = 0.24$). Given these results, moderation models were tested to determine the influence of the interaction over physical activity. Table 7 shows the unconditional growth model and the moderating models for light PA.

Predictors	Model 1 (LPA = time)		Model 2 (LPA = time)	
Fixed Effects	B	SE	B	SE
Intercept	2200.81***	237.89	2265.26***	339.73
Time	461.11***	108.20	443.66*	181.94
Weight Stigma Concerns			108.08	168.20
Subjective Vitality			332.20	218.54
Motivation to Avoid Exercise			23.50	165.85
Concerns*vitality			267.30*	125.32
Concerns*avoid			16.64	98.76
Random Effects				
Intercept	1117.08		970.21	
Time	183.38		446.98	
Error	1643.28		1696.26	
-2 Log Likelihood	3755.31		2054.03	

Table 7. Multilevel regression models to examine the effect of motivation to avoid exercise and subjective vitality on LIGHT physical activity.

Results of the moderating models (model 2 in the tables) in the various levels of physical activity revealed that the interaction between weight stigma concerns and subjective vitality was significant for moderate and light physical activity. Motivation to avoid exercise did not predict any form of physical activity on its own or as a moderator of weight stigma concerns. Table 8 shows the unconditional growth model and the moderating models for moderate PA.

Predictors	Model 1 (MPA = time)		Model 2 (MPA=concerns*avoid)	
Fixed Effects	b	SE	b	SE
Intercept	192.51***	39.27	254.62***	54.31
Time	33.97*	13.81	7.56	23.32
Weight Stigma Concerns			69.44**	25.76
Motivation to avoid exercise			-52.12	28.27
Subjective Vitality			51.68	33.64
Concerns*vitality			42.96*	18.15
Concerns*avoid			-10.35	14.41
Random Effects				
Intercept	241.99		233.30	
Time	34.24		39.61	
Error	200.37		216.93	
-2 Log Likelihood	2930.99		1624.03	

Table 8. Multilevel regression models to examine the effect of motivation to avoid exercise and subjective vitality on MODERATE physical activity. NOTE: • P<0.1, *P<0.05.

There was no change over time in vigorous physical activity and neither weight stigma concerns, motivation to avoid exercise, or subjective vitality predicted change of this variable. Table nine shows the unconditional growth model and the moderating models for vigorous PA.

Predictors	Model 1 (VPA = time)		Model 2 (VPA=concerns*avoid)	
Fixed Effects	b	SE	b	SE
Intercept	3.24	3.82	7.10	7.41
Time	3.41	3.72	4.80	6.25
Weight Stigma Concerns			2.70	3.86
Motivation to avoid exercise			-3.90	5.00
Subjective Vitality			2.21	3.81
Concerns*avoid			-1.36	2.85
Concerns*vitality			0.13	2.34
Random Effects				
Intercept	19.96		21.82	
Time	24.68		29.97	
Error	24.10		35.06	
-2 Log Likelihood	2089.25		1212.45	

Table 9. Multilevel regression models to examine the effect of motivation to avoid exercise and subjective vitality on VIGOROUS physical activity.

The significant interactions were depicted in Figure 14. Participants with higher concerns about being stigmatized had a higher level of physical activity only when they also had elevated levels of subjective vitality.

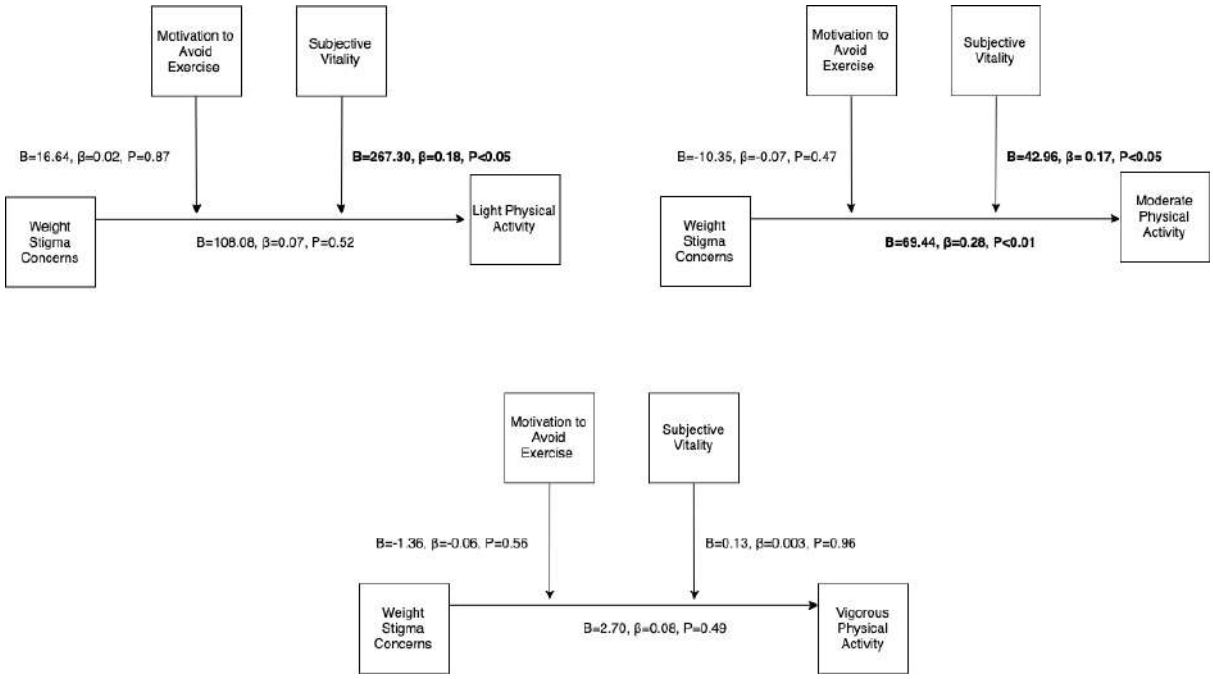


Figure 13. Moderation models testing the moderating role of motivation to avoid exercise and subjective vitality over various levels of physical activity.

Simple slope analysis reveals that the slope of high subjective vitality when predicting light physical activity is the only significant one: B= 395.41, P<0.05. This interaction is shown in Figure 15.

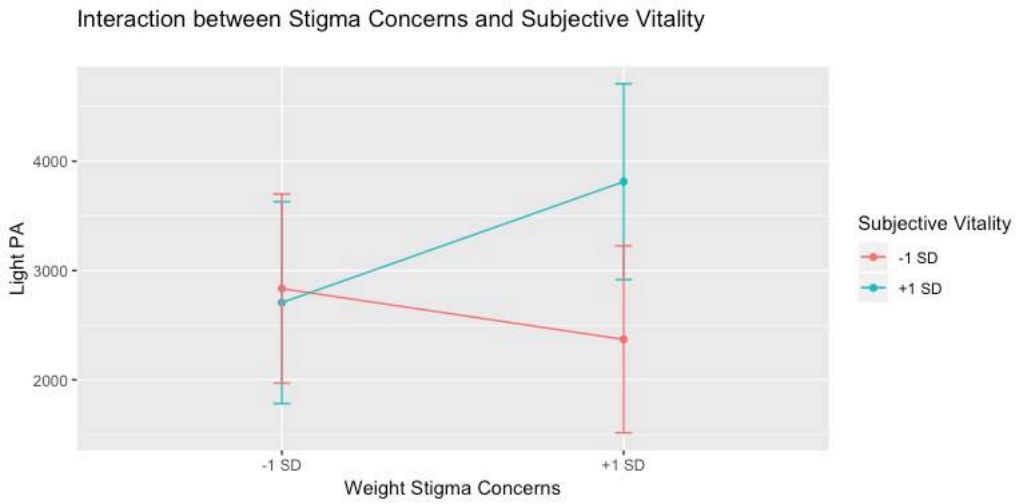


Figure 14. Interaction between stigma concerns and subjective vitality when predicting light PA.

In the case of moderate physical activity, simple slope analysis reveals that the slope of high subjective vitality is again the only significant one: B= 80.86, P<0.01. This interaction is shown in Figure 16.

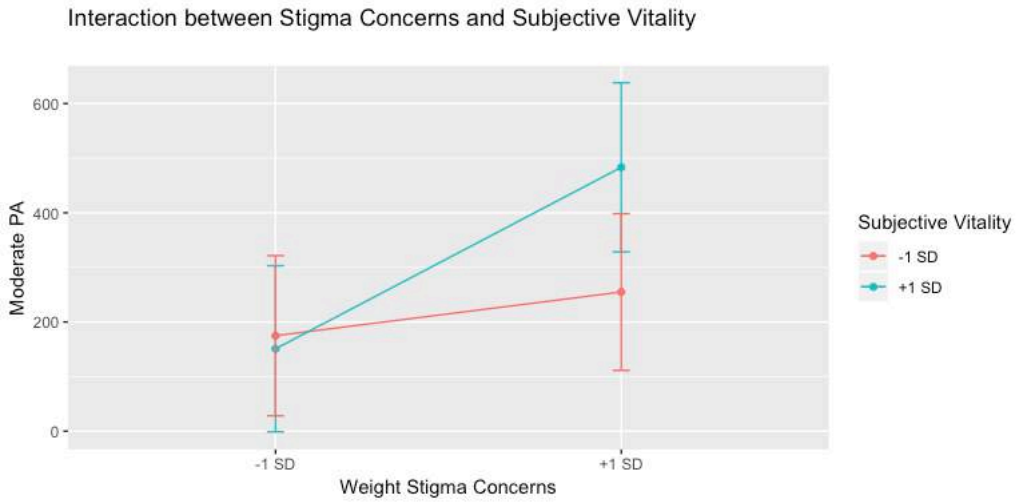


Figure 15. Interaction between stigma concerns and subjective vitality when predicting moderate PA.

8.2.4. Discussion.

Physical activity has been proven to have positive effects on the physical and mental health of individuals with obesity without requiring weight loss (Warburton & Bredin, 2017). The fact that low participation rates exist in most populations makes the promotion of this behavior a priority (Hallal et al., 2012). Weight stigma has been found to be an important limiting factor for the practice of physical activity in individuals with obesity (Vartanian & Novak, 2011; Vartanian & Shaprow, 2008), but the mechanisms by which this happens have not been explored in a longitudinal manner or taking self-control resources into account. Based on this, the current study tested the assumption that the anticipation of being stigmatized in the future will predict a decrease in different levels of physical activity as moderated by a motivation to avoid it or self-control resources as measured by subjective vitality. This evaluation was made during a physical activity promotion program over the course of four months, with objective body weight and physical activity measurements.

Moderate and light physical activity appears to increase over time. Previous research has suggested that weight stigma concerns could predict a reduction of physical activity habits and well-being through a decrease in psychological wellbeing and an increase in motivation to avoid stigma (Brenchley & Quinn, 2016; Vartanian & Novak, 2011). This increase could be evidence of motivation to escape stigma (Hunger, Major, Blodorn, & Miller, 2015), where higher weight individuals attempt to diet and/or engage in unhealthy or disordered behaviors in an attempt to shed their stigma (Haines, 2006; Neumark-Sztainer et al., 2002). In this case though, there are no indications that the practice of physical activity was unhealthy and there are two possible explanations for this: A) individuals did resort to unhealthy habits (i.e., purging, unhealthy dieting, etc.) that were overlooked by our design; or B) being involved in a specific physical activity program with the support of a dedicated app and physicians made it so that their efforts to escape stigma had a positive impact. The latter explanation could have important repercussions in our understanding of weight stigma, since more privileged individuals (those with higher socio-economic status, education, or support) could have the resources to escape stigma, thus leaving those with lower resources behind and possibly furthering the prevalence of stigma.

The current study hypothesized that physical activity of different levels would be related to weight stigma concerns as moderated by self-control resources and motivation to avoid exercise. Specifically, an increase in physical activity was to be expected when self-control was high and a decrease in physical activity when motivation to avoid exercise was high. The results of our study corroborated the first, but not second hypothesis. There was a significant increase in light and moderate physical activity over time when the self-control resources of the participants were high. No reduction was observed with low self-control or with high motivation to avoid exercise. These results confirm previous findings where weight stigma increased calorie consumption, which could be seen as a proxy for self-control (Major

et al., 2014). It did not, however, confirm the assumptions made in previous cross-sectional studies where weight stigma and exercise avoidance would predict objective physical activity (Vartanian & Novak, 2011; Vartanian & Shaprow, 2008). It is important to note, however, that our study measured physical activity over time while previous studies have looked at motivation to avoid exercise as the dependent variable.

The fact that motivation to avoid exercise did not predict a decrease in physical activity could be explained by a ceiling effect. The average minutes per month during the first month of evaluation of light physical activity was of 1957.72 and 166.03 for moderate physical activity. This implies less than an hour a day of light movements per participant and less than five minutes of moderate activity, which could be exercise. It could be that these numbers are so low that weight stigma could not possibly reduce them any further, regardless of a reduction of self-control or an increase in motivation to avoid exercise.

As previously mentioned, a past experiment by Major et al. (2014) found that calorie consumption was increased by weight stigma while perceived self-(dietary) control was reduced. Our results indicate that self-control could serve as a protective factor against stigma for the practice of health behaviors. However, we looked at anticipation of stigma, not exposure to it and it is possible that while the effects of the concerns about being stigmatized can be mitigated by self-control, direct exposure to stigma can reduce that protective factor.

Practical implications of this result include a leveraging of self-control increase intervention to serve as a protective factor against weight-based discrimination. It is important, however, to take into account that direct exposure to weight stigma might, in fact, decrease self-control resources so further research is needed to ensure that an intervention would be effective.

Although the present study was designed to address some of the limitations observed in previous studies, it has a few limitations of its own. First, this study used a sample of

individuals with sleep apnea already being treated by physicians and already in a physical activity promoting program. It is thus unclear whether conclusions could generalize to a population more heterogeneous across diagnoses and not being actively invited to participate in physical activity.

In conclusion, this study demonstrated that self-control resources play a unique role in predicting an increase in physical activity behaviors by protecting against weight stigma concerns. It also sheds light on the differences between different intensities of physical activity since levels of moderate to vigorous physical activity were extremely low in this population. These findings reinforce the utility of a motivational approach in the study of physical activity within stigmatized populations.

Chapter 9: Conclusion

9.1. Introduction.

The main objective of this thesis was to examine the relationship between weight stigma and the practice and maintenance of physical activity across different populations and mediums. More specifically, our aim was to go beyond the experiences of those receiving stigma by analyzing the sources of promotion of physical activity, which includes professionals and the internet. Three contexts were subjected to scientific study in order to form contextually grounded conclusions of the studied relationship: (1) weight stigma's presence in the overlap between physical activity promotion for weight loss and fat-talk on the internet, (2) weight stigmatizing attitudes and responses towards higher weight individuals among exercise science students, and (3) weight stigma's correlates with lower self-control and higher motivation to avoid exercise as moderators of physical activity practice.

Four studies that collected data from 586 participants, 3,772,507 tweets, and 5,801 Twitter users using questionnaires, mobile tracking, and data mining techniques were carried out for this doctoral work. Different populations such as college students, health care patients, and internet users from different countries comprised the samples. The studies used experimental, cross-sectional, longitudinal, and network data in order to understand weight stigma using a wide set of methodologies.

9.2. Is there an overlap between fat-talk and exercise-talk communities online?

We first sought to understand the relationship structure of communities talking about exercise and communities talking about fat on Twitter. Previous studies on the subject have focused mainly on specific hashtags like "fitspiration" and "thinspiration" (Harris et al., 2018; Tiggemann et al., 2018). These hashtags have limited followings and do not encompass the whole overlap between "fat" as a noun that tends to be used when promoting exercise for

weight loss (i.e., lose fat) and "fat" as an adjective that tends to be used in derogatory terms (i.e., fat person; Lydecker et al., 2016). Other studies have indeed looked at the "fat" and "obesity" related content on Twitter, but have not taken into account its network structure (Chou et al., 2014; So et al., 2016) and have not linked it to exercise related communications (Harris, Moreland-Russell, Tabak, Ruhr, & Maier, 2014b).

Recent research has suggested that the effects of screen time on adolescent well-being are negligible (Orben & Przybylski, 2019). We believe that this is a result of the broadness of the concept of screen-time. Mobile phone and social media use are on the rise (Chou et al., 2009) and have become indispensable in everyday life. Among other things, screen time can imply social media use, gaming, and other applications all of which potentially have negative consequences (Hale & Guan, 2015). There are, however, many other applications considered within screen time, such as work-related apps (i.e., word processors), shopping apps, transportation related apps, and even simple productivity apps (i.e., compass, calculator, etc.). This makes the assumption that screen time has negative effects on wellbeing as generic of a statement as saying eating has a positive effect on health. While there are indeed nutrients that have been shown to have positive effects on certain aspects of health, eating an apple is not the same as eating 500 of them or drinking antifreeze. In reference to screen time, the specific apps in use have to be specified (i.e., social media; Kim, 2017). We also believe that a further specification is necessary, since not all social networks are composed in the same way, and not everyone has the same experience. It is important, then, to specify the type of content, if there are dedicated producers of such content, and the connection between those individuals and your subject of study.

A study was designed to understand what individuals talking about "fat" and "exercise" were producing (content), whether they were consistency producing content (dedicated users), and their network structure to see if they overlap (network structure). The

study used a large-scale data set extracted from Twitter's application programming interface that contained tweets, their authors, and the users that those authors follow and are followed by. The results show the existence of dedicated users in both the fat- and the exercise-talk themes that are highly clustered together. These communities are overlapped between each other in a complex manner. It also showed that exercise related tweets are generally dedicated to the promotion of health-related physical activity, while the fat related tweets are more varied, ranging from promotion of weight loss, stigmatizing messages, and self-stigma messages.

These results add to the literature in several important ways. First, they establish the existence of networks of users that repeatedly talk about exercise and fat within Twitter. The themes of these networks vary depending on the subcommunities, which self-form within each network and talk about distinct and specific topics. This is especially relevant since previous studies that have looked at hashtags related to weight loss have shown differential effects depending on the type of content the target of stigma is exposed to (Griffiths et al., 2018), and while previous research tends to study the effects of screen time (Hale & Guan, 2015; Liu et al., 2016; Orben & Przybylski, 2019) or social media (Best, Manktelow, & Taylor, 2014), they do not specify the content the user is exposed to. This is of the utmost importance because, as the name implies, social networking sites are network based and the users connected to the person determine the person's social media experience. For example, while it has been determined that appearance comparisons made on social media are related to body image concerns (Fardouly, Pinkus, & Vartanian, 2017; Fardouly & Vartanian, 2015, 2016), these studies have looked at how individuals compare themselves to ideal bodies. This means that only individuals following accounts that share this type of content could be affected. Furthermore, homophily could be responsible for the following of these accounts,

meaning that individuals with similar characteristics could be the ones looking for this content, which could reduce the comparisons and their effects.

The study also confirms previous research that found a mostly negative representation of the word "fat" online (Chou et al., 2014; Lydecker et al., 2016; So et al., 2016). It also expands upon this research by dividing the content into user communities, which resulted in distinct themes (i.e., stigmatizing and self-stigmatizing). These results again highlight the importance of differentiating the type of social media exposure studied.

The overlap between exercise and fat also provides indirect evidence that individuals with interest in the promotion and consumption of exercise related media might also have weight stigmatizing attitudes. Previous studies have shown this to be the case (for a review see: Panza et al., 2018). The responses and intentions related to these weight stigmatizing attitudes have seldomly been explored, which is why the second research question was posed.

9.3. Are Implicit/Explicit Weight Stigmatizing Attitudes Related to Reflective/Automatic Responses in Exercise Science Students?

The second objective of this thesis was to examine the influence of implicit and explicit ant-fat attitudes on reflective intentions and automatic responses towards higher weight individuals. We were interested in three specific questions regarding these relationships: (1) do explicit weight stigmatizing attitudes predict reflective intentions to harm/facilitate individuals with obesity? (2) do implicit anti-fat attitudes predict automatic responses against individuals with obesity? (3) do implicit anti-fat attitudes also predict reflective intentions against individuals with obesity? Within these questions we also looked at the type of response (approach/avoidance), sex of target (male/female), and weight (thin/obese) as moderators of the responses. The results of our study seem to indicate that implicit stigma is related to impulsive responses, while explicit stigma elicits compensatory

reflective intentions for male targets. When the target of stigma is female, however, stigma is prevalent and overt.

Previous studies had found a high prevalence of stigmatizing attitudes in exercise science students and professionals (Panza et al., 2018). O'Brien, Hunter, and Banks (2007) compared them to psychology students and found higher implicit bias. Within that group, the higher the years of study the higher the bias. Sampedro, Quiñones, Márquez, and Robles (2012) found similar results when comparing exercise science students to kindergarten and high school students, but they also found that those most interested in physical activity (PA) tended to show more stigma. There are also important gender differences when it comes to stigmatizing attitudes in the perceivers and stigma perception in the target. For example, men have been found to be more likely to express weight bias than women (Phelan et al., 2014; Sabin, Marini, & Nosek, 2012). Additionally, the gender of the target of stigma has an influence on the attitudes and expectations that physical educators have of them (Peterson et al., 2012). Some studies suggest that female individuals with obesity perceive stigma at higher rates than their male counterparts (Puhl et al., 2008).

Our study found that implicit attitudes were related to slower reaction times only when having to approach an individual with obesity. This is extremely relevant because, as mentioned in chapter two, dual-processes are responsible for how we interact with the world (Pryor et al., 2004). While there are conscious, reflective decisions to be made when interacting with a stimulus (in this case an individual), it has been argued that the majority and most important of those reactions are automatic and made at a non-conscious level (Gawronski et al., 2014). Furthermore, there is also a relationship between explicit stigma and reflective intentions in which exercise science students have less facilitation intentions towards females when they are overweight than towards men. In the case of harmful behaviors, more implicit stigma leads to lower harm. This could be explained by the

previously studied phenomenon of compensatory behaviors (Cheval et al., 2016) where individuals with implicit stigma against a group recognize their stigma and compensate when asked explicitly. This is the reason why the results are more in line with the hypothesis when considering automatic responses.

These results are some of the first to note automatic/reflective responses to weight stigma as predicted by implicit and explicit attitudes. They also show the importance of differentiating the gender of the target since stigma seems to be different in males and females. It is interesting to note that responses to weight stigma were not measured, so ultimately the individual's response to anti-fat attitudes could be the main determinant of physical activity practice. The next two studies examine the individual's responses to stigma.

9.4. Are weight stigma processes related to each other and to Physical Activity?

After having analyzed the online social context and the pervasiveness and responses of weight stigmatizing attitudes, the third objective of this thesis was to understand how individuals with obesity respond to stigma. An initial study focused on how the different weight stigma processes (weight stigma perception, concerns, and internalization) are related to each other in either a parallel or serial way, and to physical activity. This study was transversal and used data collected from France and Mexico in order to see if cross-cultural differences like the prevalence of obesity influenced weight stigma processes. A second study aimed to expand on the findings of the first by examining the relationship between weight stigma concerns and physical activity as moderated by motivational indicators in a longitudinal manner.

Evidence concerning the effects of weight stigma over physical activity is lacking in the literature. While there is evidence to suggest that stigma might hinder variables related to the practice of physical activity (Major et al., 2014; Vartanian & Novak, 2011; Vartanian & Shaprow, 2008), little evidence exists that active behaviors are actually affected by it.

Furthermore, the different processes in which individuals process stigma have been mostly studied separately.

Results of the first study supported the serial process hypothesis in which enacted stigma predicted anticipated stigma and anticipated stigma predicted self-stigma. It also proved to be partially invariant between the two countries. These findings suggest that experiences with discrimination are related to concerns about future discriminatory encounters. These, in turn, are related to self-stigma, which serves as a deterrent for exercise through motivational mediators. The invariance of processes in countries with very different levels of obesity suggests that increased visibility of the disease in everyday life does not reduce weight stigma. The second study expands on these results by showing that in an exercise promotion program, when stigma concerns are high over time physical activity is increased only when self-control resources are high. This effect is only observed in light to moderate physical activity and weight stigma did not have a reduction effect on physical activity, possibly because of a ceiling effect where a further reduction of physical activity was impossible.

These studies provide support for previous models of stigma that had not yet been tested in a single study, but were built based on previous independent conclusions (Hunger et al., 2015; Major et al., 2018). Additionally, further longitudinal evidence failed to show a relationship between motivation to avoid exercise and physical activity practice, even though this relationship had previously been assumed in transversal research (Vartanian & Novak, 2011; Vartanian & Shaprow, 2008). This could also be explained by the ceiling effect since avoidance of exercise would imply a reduction in physical activity beyond achievable levels. Finally, the invariance of our model failed to confirm the hypothesis of visual normalization (Robinson, 2017), since the weight stigma processes and prevalence did not seem to be affected by the difference in the prevalence of obesity in both countries.

In summary, all of these studies showed the prevalence of weight stigma in our current cultural environment and in future promoters of physical activity, as well as analyzed how individuals respond to it internally and overtime. Practicing physical activity as an individual with obesity can be extremely challenging because of the prevalence of stigma and its relationship with exercise culture. Efforts to promote healthy habits for people with obesity can result in unintended stigmatization of obese individuals. This, in turn, can increase calorie consumption and lead to avoidance of exercise, creating a cycle that maintains obesity and promotes stigma. In support of this conclusion, health promoters in Mexico and France were shown to have negative attitudes and responses towards obese individuals, especially women. I have also concluded that current research on perceived discrimination is severely outdated. Mobile phones, computers and wearable sensors are constantly providing individuals with potentially stigmatizing or weight concerning information that is being mostly ignored in stigma research. This is because the concept of perceived discrimination is limited to face-to-face exposure to stigma and no other construct encompasses media related exposure. I argue that further research on stigma needs to consider on- and off-line social networks, as well as the content produced by them, in order to understand how attitudes are formed and the effects they have on long-term health.

9.5. Limitations

Despite the advances that the studies presented in this thesis have brought to the study of weight stigma and the methodological rigor that was applied to them, certain limitations should still be considered when analyzing the results.

The first study that explored Twitter communities is an exploratory, descriptive study. It highlights the existence of communities within a single social network without taking others into account. Twitter was chosen because it has, by far, the most communications about fat and obesity. It is important, however, to understand that there are both other

networking sites that do not allow external access (i.e., Facebook) and much more content in the form of blogs, videos, and other media that was not analyzed. This study also cannot show the influence of "fat" and "exercise" related messages on individuals, merely its existence.

Correlational studies (studies three and four) are limited in the sense that causal conclusions cannot be drawn from them, since there was no experimental manipulation. This means that the directionality of the relationships can be inverted (i.e., self-control predicts weight stigma concerns), which is why we place special care when developing the models with strong theoretical basis. Another issue that might arise in these types of studies is that of confounding variables, where unknown variables are the ones explaining the observed relationships.

The second study overcame these problems by relying on an experimental manipulation but is still limited by external validity. Therefore, it is hard to tell if the observed relationships between implicit stigma and automatic reactions, for example, actually occur in normal, everyday life.

Even with the current limitations, the studies presented in this thesis give rise to important questions.

9.6. Perspectives

The main outcome of this thesis, as in most academic endeavors, is not the results themselves but the questions that emerge from them. Specifically, the multi-cultural, multi-actor and multi-medium approach taken in the studies of this thesis highlight the complexities of weight stigma in the promotion of physical activity. Three main perspectives can be drawn from the conclusions. (1) Current research on the perception of stigma limits the construct to face-to-face interactions and explicit discrimination (Andreyeva, Puhl, & Brownell, 2008; Carr & Friedman, 2005; Durso & Latner, 2008). (2) Social media might be clustered into

communities which could, in turn, change the experience and the effects it has on individuals. (3) Weight stigma might influence intentions and automatic behaviors differently depending on type of stigma, intention, and sex of target. (4) There is evidence of positive stigma escape of stigma when there are high self-control resources, and a especially supportive environment.

While previous research has actually shown that news media can have negative effects on higher weight individuals (Major et al., 2014), measures of perception of stigma fail to take it into account. This creates a gap in in the measurement that could potentially be responsible for higher levels of internalized bias and weight stigma concerns. Social media could be an especially bad source of bias since study one showed the existence of dedicated stigmatizing communities.

On the other hand, it is possible that digital media, including social media, could have no real effect on individuals. Orben and Przybylski (2019) showed that their effects are negligible. We believe, however, that the effects of social networking sites on the individual should be considered not simply as media exposure, but as network produced content. The fact that individuals get to choose who they interact with and that all content in these sites is ultimately produced by users makes it so that the experiences between users differ widely. It is thus necessary to explore the effect of isolated negative social media content on the individual. If there is an effect in isolation, it is then important to determine the rate of exposure of each individual and the rate at which this exposure affects them in context.

The existence of stigmatizing communities online could also influence the attitudes of other users. Social contagion (Christakis & Fowler, 2013) could make it so that individuals with negative views about obesity can propagate those views using social networking sites as a medium of transmission. It would be important, however, to disentangle the influence of homophily from that of contagion (Lyons, 2011). This would help clarify how negative

attitudes are learned and if they can be transmitted, which in turn could result in interventions for the reduction of bias.

Differentiating the effects of weight related bias from that of gender bias is also important. Study two showed widely different responses when reacting to male and female stimuli. This could indicate that a) weight bias is entirely responsible for the results and is larger against females, 2) gender bias is entirely responsible for the results and thus male targets receive only weight related bias (this would also explain compensatory behaviors), 3) there is an additive effect between both forms of bias making it so that gender bias sums itself to weight bias, making it worse for women.

Finally, self-control appears to play a role in moderating the effects of weight stigma in the practice and maintenance of physical activity. While previous studies have suggested that other factors like avoidance (Vartanian & Novak, 2011; Vartanian & Shaprow, 2008) and self-efficacy (Major et al., 2014) could be impacted by weight stigma, our results show that self-control could help maintain physical activity. Further research is needed in order to understand the specific mechanisms in play in order to determine the effects of weight stigma on the practice of health behaviors.

References

Adorno, T. W., Frenkel-Brunswik, E., Bettelheirn, B., & Janowitz, M. (1950). *The Authoritarian Personality*. Harper and Brothers.

Alameda, M. W., & Whitehead, J. R. (2015). Comparing Levels of Anti-Fat Bias Between American and Mexican Athletes and Undergraduate Physical Education and Exercise Science Students. *The Physical Educator*, *72*, 1–22.

Albarracin, D., Johnson, B. T., Zanna, M. P., Johnson, B. T., & Zanna, M. P. (2014). *The Handbook of Attitudes*. https://doi.org/10.4324/9781410612823

Allan, J. D. (1994). A Biomedical and Feminist Perspective on Women's Experiences with Weight Management. *Western Journal of Nursing Research*, *16*(5), 524–543. https://doi.org/10.1177/019394599401600506

Allison, D. B., Basile, V. C., & Yuker, H. E. (1991). The measurement of attitudes toward and beliefs about obese persons. *International Journal of Eating Disorders*, *10*(5), 599–607. https://doi.org/10.1002/1098-108X(199109)10:5<599::AID-EAT2260100512>3.0.CO;2-#

Allon, N. (1979). Self-perceptions of the stigma of overweight in relationship to weight-losing patterns. *The American Journal of Clinical Nutrition*, *32*(2), 470–480.

Allport, G. W. (1954). *The nature of prejudice*. Oxford, England: Addison-Wesley.

Andreyeva, T., Puhl, R. M., & Brownell, K. D. (2008). Changes in Perceived Weight Discrimination Among Americans, 1995–1996 Through 2004–2006. *Obesity*, *16*(5), 1129–1134. https://doi.org/10.1038/oby.2008.35

Araiza, A. M., & Wellman, J. D. (2017). Weight stigma predicts inhibitory control and food selection in response to the salience of weight discrimination. *Appetite*, *114*, 382–390. https://doi.org/10.1016/j.appet.2017.04.009

References

Awotidebe, A., & Phillips, J. S. (2009). Knowledge and attitudes of physiotherapy students towards obesity. *South African Journal of Physiotherapy*, *65*(3), 27–31. https://doi.org/10.4102/sajp.v65i3.90

Bacon, J., Scheltema, K., & Robinson, B. (2001). Fat phobia scale revisited: The short form. *International Journal of Obesity*, *25*(2), 252–257. https://doi.org/10.1038/sj.ijo.0801537

Baron, R., & Kenny, D. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173–1182. https://doi.org/10.1037//0022-3514.51.6.1173

Baumeister, R. F. (2002). Ego Depletion and Self-Control Failure: An Energy Model of the Self's Executive Function. *Self and Identity*, *1*(2), 129–136. https://doi.org/10.1080/152988602317319302

Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The Strength Model of Self-Control. *Current Directions in Psychological Science*, *16*(6), 351–355. https://doi.org/10.1111/j.1467-8721.2007.00534.x

Befort, C. A., Allen Greiner, K., Hall, S., Pulvers, K. M., Nollen, N. L., Charbonneau, A., … Ahluwalia, J. S. (2006). Weight-Related Perceptions Among Patients and Physicians. *Journal of General Internal Medicine*, *21*(10), 1086–1090. https://doi.org/10.1111/j.1525-1497.2006.00567.x

Benotti, P. N., Still, C. D., Craig Wood, G., Akmal, Y., King, H., Arousy, H. E., … Strodel, W. (2009). Preoperative Weight Loss Before Bariatric Surgery. *Archives of Surgery (Chicago, Ill. : 1960)*, *144*(12), 1150–1155. https://doi.org/10.1001/archsurg.2009.209

Berry, T. R., Elfeddali, I., & de Vries, H. (2014). Changing fit and fat bias using an implicit retraining task. *Psychology & Health*, *29*(7), 796–812. https://doi.org/10.1080/08870446.2014.885024

Bessenoff, G. R., & Sherman, J. W. (2000). Automatic and Controlled Components of Prejudice Toward Fat People: Evaluation Versus Stereotype Activation. *Social Cognition*, *18*(4), 329–353. https://doi.org/10.1521/soco.2000.18.4.329

Best, P., Manktelow, R., & Taylor, B. (2014). Online communication, social media and adolescent wellbeing: A systematic narrative review. *Children and Youth Services Review*, *41*, 27–36. https://doi.org/10.1016/j.childyouth.2014.03.001

Blair, S. N., & LaMonte, M. J. (2006). Commentary: Current perspectives on obesity and health: black and white, or shades of grey? *International Journal of Epidemiology*, *35*(1), 69–72. https://doi.org/10.1093/ije/dyi259

Blanton, H., & Jaccard, J. (2015). Not So Fast: Ten Challenges to Importing Implicit Attitude Measures to Media Psychology. *Media Psychology*, *18*(3), 338–369. https://doi.org/10.1080/15213269.2015.1008102

Blanton, H., Jaccard, J., Klick, J., Mellers, B., Mitchell, G., & Tetlock, P. E. (2009). Strong claims and weak evidence: Reassessing the predictive validity of the IAT. *Journal of Applied Psychology*, *94*(3), 567–582. https://doi.org/10.1037/a0014665

Blanton, H., Jaccard, J., Strauts, E., Mitchell, G., & Tetlock, P. E. (2015). Toward a meaningful metric of implicit prejudice. *Journal of Applied Psychology*, *100*(5), 1482–1482. https://doi.org/10.1037/a0039215

Blei, D. M., Ng, A. Y., & Jordan, M. I. (2003). Latent Dirichlet Allocation. *Journal of Machine Learning Research*, *3*(Jan), 993–1022.

References

Blondel, V. D., Guillaume, J.-L., Lambiotte, R., & Lefebvre, E. (2008). Fast unfolding of communities in large networks. *Journal of Statistical Mechanics: Theory and Experiment*, *2008*(10), P10008. https://doi.org/10.1088/1742-5468/2008/10/P10008

Bocquier, A., Verger, P., Basdevant, A., Andreotti, G., Baretge, J., Villani, P., & Paraponaris, A. (2005). Overweight and Obesity: Knowledge, Attitudes, and Practices of General Practitioners in France. *Obesity Research*, *13*(4), 787–795. https://doi.org/10.1038/oby.2005.89

Bolden, R., & Moscarola, J. (2000). Bridging the quantitative-qualitative divide: The lexical approach to textual data analysis. *Social Science Computer Review*, *18*(4), 450–460.

Booth, M. (2000). Assessment of Physical Activity: An International Perspective. *Research Quarterly for Exercise and Sport*, *71*(2), 114–120. https://doi.org/10.1080/02701367.2000.11082794

Brenchley, K. J., & Quinn, D. M. (2016). Weight-based rejection sensitivity: Scale development and implications for well-being. *Body Image*, *16*, 79–92. https://doi.org/10.1016/j.bodyim.2015.11.005

Brewer, M. B. (1998). Category-based vs. Person-based Perception in Intergroup Contexts. *European Review of Social Psychology*, *9*(1), 77–106. https://doi.org/10.1080/14792779843000054

Brewis, A. A., & Wutich, A. (2012). Explicit versus implicit fat-stigma. *American Journal of Human Biology*, *24*(3), 332–338. https://doi.org/10.1002/ajhb.22233

Brewis, A., SturtzSreetharan, C., & Wutich, A. (2018). Obesity stigma as a globalizing health challenge. *Globalization and Health*, *14*(1). https://doi.org/10.1186/s12992-018-0337-x

Brochu, P. M., & Esses, V. M. (2011). What's in a Name? The Effects of the Labels "Fat" Versus "Overweight" on Weight Bias1. *Journal of Applied Social Psychology*, *41*(8), 1981–2008. https://doi.org/10.1111/j.1559-1816.2011.00786.x

Brown, H. E., Atkin, A. J., Panter, J., Wong, G., Chinapaw, M. J. M., & van Sluijs, E. M. F. (2016). Family-based interventions to increase physical activity in children: A systematic review, meta-analysis and realist synthesis: Meta-analysis/realist synthesis of family PA interventions. *Obesity Reviews*, *17*(4), 345–360. https://doi.org/10.1111/obr.12362

Brown, I. (2006). Nurses' attitudes towards adult patients who are obese: Literature review. *Journal of Advanced Nursing*, *53*(2), 221–232. https://doi.org/10.1111/j.1365-2648.2006.03718.x

Butryn, M. L., Webb, V., & Wadden, T. A. (2011). Behavioral Treatment of Obesity. *The Psychiatric Clinics of North America*, *34*(4), 841–859. https://doi.org/10.1016/j.psc.2011.08.006

Buuren, S., & Groothuis-Oudshoorn, K. (2011). mice: Multivariate imputation by chained equations in R. *Journal of Statistical Software*, *45*(3).

Callahan, D. (2013). Obesity: Chasing an elusive epidemic. *The Hastings Center Report*, *43*(1), 34–40. https://doi.org/10.1002/hast.114

Campbell, K., & Crawford, D. (2000). Management of obesity: Attitudes and practices of Australian dietitians. *International Journal of Obesity*, *24*(6), 701–710. https://doi.org/10.1038/sj.ijo.0801226

Cannon, C. P., & Kumar, A. (2009). Treatment of overweight and obesity: Lifestyle, pharmacologic, and surgical options. *Clinical Cornerstone*, *9*(4), 55–71. https://doi.org/10.1016/S1098-3597(09)80005-7

References

Carels, R.A., Wott, C. B., Young, K. M., Gumble, A., Koball, A., & Oehlhof, M. W. (2010). Implicit, explicit, and internalized weight bias and psychosocial maladjustment among treatment-seeking adults. *Eating Behaviors*, *11*(3), 180–185. https://doi.org/10.1016/j.eatbeh.2010.03.002

Carels, Robert A., & Musher-Eizenman, D. R. (2010). Individual differences and weight bias: Do people with an anti-fat bias have a pro-thin bias? *Body Image*, *7*(2), 143–148. https://doi.org/10.1016/j.bodyim.2009.11.005

Carlsson, R., & Agerström, J. (2016). A closer look at the discrimination outcomes in the IAT literature. *Scandinavian Journal of Psychology*, *57*(4), 278–287. https://doi.org/10.1111/sjop.12288

Carr, D., & Friedman, M. A. (2005). Is Obesity Stigmatizing? Body Weight, Perceived Discrimination, and Psychological Well-Being in the United States. *Journal of Health and Social Behavior*, *46*(3), 244–259. https://doi.org/10.1177/002214650504600303

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports*, *100*(2), 126–131.

Catenacci, V. A., & Wyatt, H. R. (2007). The role of physical activity in producing and maintaining weight loss. *Nature Clinical Practice. Endocrinology & Metabolism*, *3*(7), 518–529. https://doi.org/10.1038/ncpendmet0554

Centola, D. (2010). The Spread of Behavior in an Online Social Network Experiment. *Science*, *329*(5996), 1194–1197. https://doi.org/10.1126/science.1189910

Chambliss, H. O., Finley, C. E., & Blair, S. N. (2004). Attitudes toward Obese Individuals among Exercise Science Students: *Medicine & Science in Sports & Exercise*, *36*(3), 468–474. https://doi.org/10.1249/01.MSS.0000117115.94062.E4

Chen, M., & Bargh, J. A. (1999). Consequences of Automatic Evaluation: Immediate Behavioral Predispositions to Approach or Avoid the Stimulus. *Personality and Social Psychology Bulletin*, *25*(2), 215–224. https://doi.org/10.1177/0146167299025002007

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating Goodness-of-Fit Indexes for Testing Measurement Invariance. *Structural Equation Modeling: A Multidisciplinary Journal*, *9*(2), 233–255. https://doi.org/10.1207/S15328007SEM0902_5

Cheval, B., Radel, R., Grob, E., Ghisletta, P., Bianchi-Demicheli, F., & Chanal, J. (2016). Homophobia: An Impulsive Attraction to the Same Sex? Evidence From Eye-Tracking Data in a Picture-Viewing Task. *The Journal of Sexual Medicine*, *13*(5), 825–834. https://doi.org/10.1016/j.jsxm.2016.02.165

Cheval, B., Sarrazin, P., & Pelletier, L. (2014). Impulsive Approach Tendencies towards Physical Activity and Sedentary Behaviors, but Not Reflective Intentions, Prospectively Predict Non-Exercise Activity Thermogenesis. *PLoS ONE*, *9*(12), e115238. https://doi.org/10.1371/journal.pone.0115238

Chevance, G., Héraud, N., Guerrieri, A., Rebar, A., & Boiché, J. (2017). Measuring implicit attitudes toward physical activity and sedentary behaviors: Test-retest reliability of three scoring algorithms of the Implicit Association Test and Single Category-Implicit Association Test. *Psychology of Sport and Exercise*, *31*, 70–78. https://doi.org/10.1016/j.psychsport.2017.04.007

Choquet, H., & Meyre, D. (2011). Genetics of Obesity: What have we Learned? *Current Genomics*, *12*(3), 169–179. https://doi.org/10.2174/138920211795677895

Chou, W. S., Hunt, Y. M., Beckjord, E. B., Moser, R. P., & Hesse, B. W. (2009). Social Media Use in the United States: Implications for Health Communication. *Journal of Medical Internet Research*, *11*(4). https://doi.org/10.2196/jmir.1249

References

Chou, W. S., Prestin, A., & Kunath, S. (2014). Obesity in social media: A mixed methods analysis. *Translational Behavioral Medicine*, *4*(3), 314–323. https://doi.org/10.1007/s13142-014-0256-1

Christakis, N. A., & Fowler, J. H. (2013). Social contagion theory: Examining dynamic social networks and human behavior. *Statistics in Medicine*, *32*(4). https://doi.org/10.1002/sim.5408

Clarkson, J. J., Otto, A. S., Hirt, E. R., & Egan, P. M. (2016). The Malleable Efficacy of Willpower Theories. *Personality and Social Psychology Bulletin*, *42*(11), 1490–1504.

Clément-Guillotin, C., Radel, R., & Chalabaev, A. (2015). If You Are Old and Do Not Want to Fall into The Traditional Stereotype—Be Physically Active! *Experimental Aging Research*, *41*(4), 446–462.

Craft, L. L., & Perna, F. M. (2004). The Benefits of Exercise for the Clinically Depressed. *Primary Care Companion to The Journal of Clinical Psychiatry*, *6*(3), 104–111.

Cramer, P., & Steinwert, T. (1998). Thin is good, fat is bad: How early does it begin? *Journal of Applied Developmental Psychology*, *19*(3), 429–451. https://doi.org/10.1016/S0193-3973(99)80049-5

Crandall, C. S. (1994). Prejudice against fat people: Ideology and self-interest. *Journal of Personality and Social Psychology*, *66*(5), 882.

Crandall, C. S., D'Anello, S., Sakalli, N., Lazarus, E., Nejtardt, G. W., & Feather, N. T. (2001). An Attribution-Value Model of Prejudice: Anti-Fat Attitudes in Six Nations. *Personality and Social Psychology Bulletin*, *27*(1), 30–37. https://doi.org/10.1177/0146167201271003

Crandall, C. S., Eshleman, A., & O'Brien, L. (2002). Social norms and the expression and suppression of prejudice: The struggle for internalization. *Journal of Personality and Social Psychology*, *82*(3), 359–378. https://doi.org/10.1037/0022-3514.82.3.359

Crescioni, A. W., Ehrlinger, J., Alquist, J. L., Conlon, K. E., Baumeister, R. F., Schatschneider, C., & Dutton, G. R. (2011). High trait self-control predicts positive health behaviors and success in weight loss. *Journal of Health Psychology*, *16*(5), 750–759. https://doi.org/10.1177/1359105310390247

Crocker, J., Major, B., & Steele, C. (1998). Social stigma. In *The handbook of social psychology* (4th Edition, pp. 504–553). New York, NY, US: McGraw-Hill.

Crosnoe, R., & Pagan, M. (2007). Gender, obesity, and education. *Sociology of Education*, 241–260.

Cuddy, A. J. C., Fiske, S. T., & Glick, P. (2007). The BIAS map: Behaviors from intergroup affect and stereotypes. *Journal of Personality and Social Psychology*, *92*(4), 631–648. https://doi.org/10.1037/0022-3514.92.4.631

Dang, J. (2018). An updated meta-analysis of the ego depletion effect. *Psychological Research*, *82*(4), 645–651. https://doi.org/10.1007/s00426-017-0862-x

Degner, J., & Dalege, J. (2013). The apple does not fall far from the tree, or does it? A meta-analysis of parent-child similarity in intergroup attitudes. *Psychological Bulletin*, *139*(6), 1270–1304. https://doi.org/10.1037/a0031436

Dehon, E., Weiss, N., Jones, J., Faulconer, W., Hinton, E., Sterling, S., & Choo, E. K. (2017). A Systematic Review of the Impact of Physician Implicit Racial Bias on Clinical Decision Making. *Academic Emergency Medicine*, *24*(8), 895–904. https://doi.org/10.1111/acem.13214

Devine, P. G. (1989). Stereotypes and prejudice: Their automatic and controlled components. *Journal of Personality and Social Psychology*, *56*(1), 5–18. https://doi.org/10.1037/0022-3514.56.1.5

Dimmock, J. A., Hallett, B. E., & Grove, R. J. (2009). Attitudes Toward Overweight Individuals Among Fitness Center Employees: An Examination of Contextual Effects.

Research Quarterly for Exercise and Sport, *80*(3), 641–647. https://doi.org/10.1080/02701367.2009.10599603

Dovidio, J. F., & Gaertner, S. L. (2010). Intergroup Bias. In *Handbook of Social Psychology*. https://doi.org/10.1002/9780470561119.socpsy002029

Dovidio, J. F., Love, A., Schellhaas, F. M. H., & Hewstone, M. (2017). Reducing intergroup bias through intergroup contact: Twenty years of progress and future directions. *Group Processes & Intergroup Relations*, *20*(5), 606–620. https://doi.org/10.1177/1368430217712052

Dovidio, J. F., Major, B., & Crocker, J. (2000). Stigma: Introduction and overview. In *The social psychology of stigma* (pp. 1–28). New York, NY, US: Guilford Press.

Dovidio, J. F., Schelhaas, F. M. H., & Pearson, A. R. (2005). The Role of Attitudes in Intergtoup Relations. In *The Handbook of Attitudes* (Vol. 2). New York, NY: Psychology Press.

Duckworth, A. L., & Kern, M. L. (2011). A meta-analysis of the convergent validity of self-control measures. *Journal of Research in Personality*, *45*(3), 259–268. https://doi.org/10.1016/j.jrp.2011.02.004

Durso, L. E., & Latner, J. D. (2008). Understanding self-directed stigma: Development of the weight bias internalization scale. *Obesity (Silver Spring, Md.)*, *16 Suppl 2*, S80-86. https://doi.org/10.1038/oby.2008.448

Durso, L. E., Latner, J. D., & Hayashi, K. (2012). Perceived Discrimination Is Associated with Binge Eating in a Community Sample of Non-Overweight, Overweight, and Obese Adults. *Obesity Facts*, *5*(6), 869–880. https://doi.org/10.1159/000345931

Eisenberg, M. E., Carlson-McGuire, A., Gollust, S. E., & Neumark-Sztainer, D. (2015). A content analysis of weight stigmatization in popular television programming for

adolescents: Content Analysis of Weight Stigmatization. *International Journal of Eating Disorders*, *48*(6), 759–766. https://doi.org/10.1002/eat.22348

Emile, M., d'Arripe-Longueville, F., Cheval, B., Amato, M., & Chalabaev, A. (2015). An Ego Depletion Account of Aging Stereotypes' Effects on Health-Related Variables. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, *70*(6), 876–885. https://doi.org/10.1093/geronb/gbu168

Eysenbach, G. (2008). Medicine 2.0: Social Networking, Collaboration, Participation, Apomediation, and Openness. *Journal of Medical Internet Research*, *10*(3). https://doi.org/10.2196/jmir.1030

Fabricatore, A. N., & Wadden, T. A. (2004). Psychological aspects of obesity. *Clinics in Dermatology*, *22*(4), 332–337. https://doi.org/10.1016/j.clindermatol.2004.01.006

Faloutsos, M., Faloutsos, P., & Faloutsos, C. (1999). On Power-Law Relationships of the Internet Topology. *Proceedings of the Conference on Applications, Technologies, Architectures, and Protocols for Computer Communication*, 251–262.

Fan, M., & Jin, Y. (2014). Obesity and Self-control: Food Consumption, Physical Activity, and Weight-loss Intention. *Applied Economic Perspectives and Policy*, *36*(1), 125–145. https://doi.org/10.1093/aepp/ppt034

Fardouly, J., Pinkus, R. T., & Vartanian, L. R. (2017). The impact of appearance comparisons made through social media, traditional media, and in person in women's everyday lives. *Body Image*, *20*, 31–39. https://doi.org/10.1016/j.bodyim.2016.11.002

Fardouly, J., & Vartanian, L. R. (2015). Negative comparisons about one's appearance mediate the relationship between Facebook usage and body image concerns. *Body Image*, *12*, 82–88. https://doi.org/10.1016/j.bodyim.2014.10.004

References

Fardouly, J., & Vartanian, L. R. (2016). Social Media and Body Image Concerns: Current Research and Future Directions. *Current Opinion in Psychology*, *9*, 1–5. https://doi.org/10.1016/j.copsyc.2015.09.005

Fardouly, J., Willburger, B. K., & Vartanian, L. R. (2017). Instagram use and young women's body image concerns and self-objectification: Testing mediational pathways. *New Media & Society*, 146144481769449. https://doi.org/10.1177/1461444817694499

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*(4), 1149–1160. https://doi.org/10.3758/BRM.41.4.1149

Fazio, R. H. (1990). Multiple Processes by which Attitudes Guide Behavior: The Mode Model as an Integrative Framework. In *Advances in Experimental Social Psychology* (Vol. 23, pp. 75–109). https://doi.org/10.1016/S0065-2601(08)60318-4

Fiedler, K., Messner, C., & Bluemke, M. (2006). Unresolved problems with the "I", the "A", and the "T": A logical and psychometric critique of the Implicit Association Test (IAT). *European Review of Social Psychology*, *17*(1), 74–147. https://doi.org/10.1080/10463280600681248

Fisher, R. J. (1993). Social Desirability Bias and the Validity of Indirect Questioning. *Journal of Consumer Research*, *20*(2), 303. https://doi.org/10.1086/209351

Fiske, S. T. (1998). Stereotyping, prejudice, and discrimination. In *The handbook of social psychology* (Vol. 2, pp. 357–411).

Fiske, Susan T., Cuddy, A. J. C., Glick, P., & Xu, J. (2002). A model of (often mixed) stereotype content: Competence and warmth respectively follow from perceived status and competition. *Journal of Personality and Social Psychology*, *82*(6), 878–902. https://doi.org/10.1037/0022-3514.82.6.878

Fiske, Susan T., & Neuberg, S. (1990). A Continuum of Impression Formation, from Category-Based to Individuating Processes: Influences of Information and Motivation on Attention and Interpretation. *Advances in Experimental Social Psychology*, *23*(C), 1–74. https://doi.org/10.1016/S0065-2601(08)60317-2

Fiske, Susan T., & Taylor, S. E. (2013). *Social Cognition: From Brains to Culture*. SAGE.

Flint, S. W., Hudson, J., & Lavallee, D. (2015). UK adults' implicit and explicit attitudes towards obesity: A cross-sectional study. *BMC Obesity*, *2*(1), 31. https://doi.org/10.1186/s40608-015-0064-2

Fontana, F., Furtado, O., Mazzardo, O., Hong, D., & de Campos, W. (2017). Anti-fat bias by professors teaching physical education majors. *European Physical Education Review*, *23*(1), 127–138. https://doi.org/10.1177/1356336X16643304

Forestier, C., Sarrazin, P., Allenet, B., Gauchet, A., Heuzé, J.-P., & Chalabaev, A. (2018). "Are you in full possession of your capacity?". A mechanistic self-control approach at trait and state levels to predict different health behaviors. *Personality and Individual Differences*, *134*, 214–221. https://doi.org/10.1016/j.paid.2018.05.044

Foster, G. D., Wadden, T. A., Makris, A. P., Davidson, D., Sanderson, R. S., Allison, D. B., & Kessler, A. (2003). Primary Care Physicians' Attitudes about Obesity and Its Treatment. *Obesity Research*, *11*(10), 1168–1177. https://doi.org/10.1038/oby.2003.161

Fox, S. (2011). *The Social Life of Health Information*. Retrieved from Pew Research Center website: https://www.pewinternet.org/2011/05/12/the-social-life-of-health-information-2011/

Gaertner, S. L., & Dovidio, J. F. (1986). The aversive form of racism. In *Prejudice, discrimination, and racism* (pp. 61–89). San Diego, CA, US: Academic Press.

References

Gámez-Guadix, M. (2014). Depressive Symptoms and Problematic Internet Use Among Adolescents: Analysis of the Longitudinal Relationships from the Cognitive–Behavioral Model. *Cyberpsychology, Behavior, and Social Networking*, *17*(11), 714–719. https://doi.org/10.1089/cyber.2014.0226

García Sandoval, J. R., Caracuel, J. C., Cocca, A., Cocca, M., & Ceballos Gurrola, O. (2017). Relation Between Body Mass Index and Body Image in Spanish and Mexican Adolescents. *Behavioral Medicine*, 1–9. https://doi.org/10.1080/08964289.2017.1332303

Gawronski, B, Sherman, J. W., & Trope, Y. (2014). Two of What? A Conceptual Analysis of Dual-Process Theories. In *Dual-Process Theories of the Social Mind* (pp. 3–19). New York: The Guilford Press.

Gawronski, Bertram, & Bodenhausen, G. V. (2007). Unraveling the Processes Underlying Evaluation: Attitudes from the Perspective of the Ape Model. *Social Cognition*, *25*(5), 687–717. https://doi.org/10.1521/soco.2007.25.5.687

GBD 2015 Obesity Collaborators. (2017). Health Effects of Overweight and Obesity in 195 Countries over 25 Years. *New England Journal of Medicine*, *377*(1), 13–27. https://doi.org/10.1056/NEJMoa1614362

Goffman, E. (1963). *Stigma: Notes on the Management of Spoiled Identity*. Englewood Cliffs, NJ: Prentice-Hall.

Greenberg, B. S., Eastin, M., Hofschire, L., Lachlan, K., & Brownell, K. D. (2003). Portrayals of Overweight and Obese Individuals on Commercial Television. *American Journal of Public Health*, *93*(8), 1342–1348.

Greenleaf, C., & Weiller, K. (2005). Perceptions of Youth Obesity among Physical Educators. *Social Psychology of Education*, *8*(4), 407–423. https://doi.org/10.1007/s11218-005-0662-9

Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: Attitudes, self-esteem, and stereotypes. *Psychological Review*, *102*(1), 4–27. https://doi.org/10.1037/0033-295X.102.1.4

Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology*, *74*(6), 1464.

Greenwald, A. G., Poehlman, T. A., Uhlmann, E. L., & Banaji, M. R. (2009). Understanding and using the Implicit Association Test: III. Meta-analysis of predictive validity. *Journal of Personality and Social Psychology*, *97*(1), 17–41. https://doi.org/10.1037/a0015575

Griffiths, S., Castle, D., Cunningham, M., Murray, S. B., Bastian, B., & Barlow, F. K. (2018). How does exposure to thinspiration and fitspiration relate to symptom severity among individuals with eating disorders? Evaluation of a proposed model. *Body Image*, *27*, 187–195. https://doi.org/10.1016/j.bodyim.2018.10.002

Hagger, M. S., Chatzisarantis, N. L. D., Alberts, H., Anggono, C. O., Batailler, C., Birt, A. R., … Zwienenberg, M. (2016). A Multilab Preregistered Replication of the Ego-Depletion Effect. *Perspectives on Psychological Science*, *11*(4), 546–573. https://doi.org/10.1177/1745691616652873

Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. L. D. (2010). Ego depletion and the strength model of self-control: A meta-analysis. *Psychological Bulletin*, *136*(4), 495–525. https://doi.org/10.1037/a0019486

Haines, J. (2006). Weight Teasing and Disordered Eating Behaviors in Adolescents: Longitudinal Findings From Project EAT (Eating Among Teens). *PEDIATRICS*, *117*(2), e209–e215. https://doi.org/10.1542/peds.2005-1242

Hair, J., Black, W., Babin, B., & Anderson, R. (2010). *Multivariate Data Analysis* (7th Edition). New York, NY: Pearson.

Hale, L., & Guan, S. (2015). Screen time and sleep among school-aged children and adolescents: A systematic literature review. *Sleep Medicine Reviews*, *21*, 50–58. https://doi.org/10.1016/j.smrv.2014.07.007

Hall, K. D., Sacks, G., Chandramohan, D., Chow, C. C., Wang, Y. C., Gortmaker, S. L., & Swinburn, B. A. (2011). Quantification of the effect of energy imbalance on bodyweight. *The Lancet*, *378*(9793), 826–837. https://doi.org/10.1016/S0140-6736(11)60812-X

Hallal, P. C., Andersen, L. B., Bull, F. C., Guthold, R., Haskell, W., & Ekelund, U. (2012). Global physical activity levels: Surveillance progress, pitfalls, and prospects. *The Lancet*, *380*(9838), 247–257. https://doi.org/10.1016/S0140-6736(12)60646-1

Hambleton, R. K. (2005). Issues, designs, and technical guidelines for adapting tests into multiple languages and cultures. In *Adapting psychological and educational tests for cross-cultural assessment* (pp. 3–38). Mahwah, NJ: Lawrence Erlbaum.

Harris, J. (1993). Young people's perceptions of health, fitness and exercise. *British Journal of Physical Education Research Supplement*, *13*, 5–9.

Harris, J. K., Duncan, A., Men, V., Shevick, N., Krauss, M. J., & Cavazos-Rehg, P. A. (2018). Messengers and Messages for Tweets That Used #thinspo and #fitspo Hashtags in 2016. *Preventing Chronic Disease*, *15*. https://doi.org/10.5888/pcd15.170309

Harris, J. K., Moreland-Russell, S., Tabak, R. G., Ruhr, L. R., & Maier, R. C. (2014a). Communication about childhood obesity on Twitter. *American Journal of Public Health*, *104*(7), e62-69. https://doi.org/10.2105/AJPH.2013.301860

Harris, J. K., Moreland-Russell, S., Tabak, R. G., Ruhr, L. R., & Maier, R. C. (2014b). Communication About Childhood Obesity on Twitter. *American Journal of Public Health*, *104*(7), e62–e69. https://doi.org/10.2105/AJPH.2013.301860

Harris, J. K., Cale, L., Duncombe, R., & Musson, H. (2018). Young people's knowledge and understanding of health, fitness and physical activity: Issues, divides and dilemmas. *Sport, Education and Society*, *23*(5), 407–420. https://doi.org/10.1080/13573322.2016.1228047

Harvey, E. L., Summerbell, C. D., Kirk, S. F. L., & Hill, A. J. (2002). Dietitians' views of overweight and obese people and reported management practices. *Journal of Human Nutrition and Dietetics*, *15*(5), 331–347. https://doi.org/10.1046/j.1365-277X.2002.00385.x

Hatzenbuehler, M. L., Keyes, K. M., & Hasin, D. S. (2009). Associations between perceived weight discrimination and the prevalence of psychiatric disorders in the general population. *Obesity (Silver Spring, Md.)*, *17*(11), 2033–2039. https://doi.org/10.1038/oby.2009.131

Hayward, L. E., Tropp, L. R., Hornsey, M. J., & Barlow, F. K. (2017). Toward a comprehensive understanding of intergroup contact: Descriptions and mediators of positive and negative contact among majority and minority groups. *Personality and Social Psychology Bulletin*, *43*(3), 347–364. https://doi.org/10.1177/0146167216685291

Hayward, L. E., Vartanian, L. R., & Pinkus, R. T. (2018). Weight Stigma Predicts Poorer Psychological Well-Being Through Internalized Weight Bias and Maladaptive Coping Responses. *Obesity*, *26*(4), 755–761. https://doi.org/10.1002/oby.22126

References

Hebl, M., & Xu, J. (2001). Weighing the care: Physicians' reactions to the size of a patient. *International Journal of Obesity*, *25*(8), 1246–1252. https://doi.org/10.1038/sj.ijo.0801681

Himelboim, I., & Han, J. Y. (2014). Cancer Talk on Twitter: Community Structure and Information Sources in Breast and Prostate Cancer Social Networks. *Journal of Health Communication*, *19*(2), 210–225. https://doi.org/10.1080/10810730.2013.811321

Himmelstein, M. S., Puhl, R. M., & Quinn, D. M. (2018). Weight stigma and health: The mediating role of coping responses. *Health Psychology*, *37*(2), 139–147. https://doi.org/10.1037/hea0000575

Hodson, G., & Dhont, K. (2015). The person-based nature of prejudice: Individual difference predictors of intergroup negativity. *European Review of Social Psychology*, *26*(1), 1–42. https://doi.org/10.1080/10463283.2015.1070018

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Hunger, J. M., & Major, B. (2015). Weight stigma mediates the association between BMI and self-reported health. *Health Psychology*, *34*(2), 172.

Hunger, J. M., Major, B., Blodorn, A., & Miller, C. T. (2015). Weighed Down by Stigma: How Weight-Based Social Identity Threat Contributes to Weight Gain and Poor Health. *Social and Personality Psychology Compass*, *9*(6), 255–268.

Idler, E. L., & Benyamini, Y. (1997). Self-Rated Health and Mortality: A Review of Twenty-Seven Community Studies. *Journal of Health and Social Behavior*, *38*(1), 21. https://doi.org/10.2307/2955359

Inzlicht, M., & Kang, S. K. (2010). Stereotype threat spillover: How coping with threats to social identity affects aggression, eating, decision making, and attention. *Journal of Personality and Social Psychology*, *99*(3), 467–481. https://doi.org/10.1037/a0018951

Jackson, S. E., & Steptoe, A. (2017). Association between perceived weight discrimination and physical activity: A population-based study among English middle-aged and older adults. *BMJ Open*, *7*(3), e014592.

Janssen, I., & LeBlanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *International Journal of Behavioral Nutrition and Physical Activity*, *7*(1), 40. https://doi.org/10.1186/1479-5868-7-40

Jung, F. U. C. E., Luck-Sikorski, C., Wiemers, N., & Riedel-Heller, S. G. (2015). Dietitians and Nutritionists: Stigma in the Context of Obesity. A Systematic Review. *PLOS ONE*, *10*(10), e0140276. https://doi.org/10.1371/journal.pone.0140276

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, *39*(1), 31–36. https://doi.org/10.1007/BF02291575

Karnehed, N., Rasmussen, F., Hemmingsson, T., & Tynelius, P. (2006). Obesity and Attained Education: Cohort Study of More Than 700,000 Swedish Men*. *Obesity*, *14*(8), 1421–1428. https://doi.org/10.1038/oby.2006.161

Kervyn, N., Fiske, S., & Yzerbyt, V. (2015). Forecasting the Primary Dimension of Social Perception: Symbolic and Realistic Threats Together Predict Warmth in the Stereotype Content Model. *Social Psychology*, *46*(1), 36–45. https://doi.org/10.1027/1864-9335/a000219

Kilpatrick, M., Hebert, E., & Bartholomew, J. (2005). College Students' Motivation for Physical Activity: Differentiating Men's and Women's Motives for Sport

Participation and Exercise. *Journal of American College Health*, *54*(2), 87–94. https://doi.org/10.3200/JACH.54.2.87-94

Kim, H. H. (2017). The impact of online social networking on adolescent psychological well-being (WB): A population-level analysis of Korean school-aged children. *International Journal of Adolescence and Youth*, *22*(3), 364–376. https://doi.org/10.1080/02673843.2016.1197135

Klassen, M. L., Jasper, C. R., & Harris, R. J. (1993). The role of physical appearance in managerial decisions. *Journal of Business and Psychology*, *8*(2), 181–198. https://doi.org/10.1007/BF02230384

Klein, H., & Shiffman, K. S. (2005). Thin is "in" and stout is "out": What animated cartoons tell viewers about body weight. *Eating and Weight Disorders : EWD*, *10*(2), 107–116.

Klein, Hugh, & Shiffman, K. S. (2006). Messages about Physical Attractiveness in Animated Cartoons. *Body Image*, *3*(4), 353–363. https://doi.org/10.1016/j.bodyim.2006.08.001

Koball, A. M., Mueller, P. S., Craner, J., Clark, M. M., Nanda, S., Kebede, E. B., & Grothe, K. B. (2018). Crucial conversations about weight management with healthcare providers: Patients' perspectives and experiences. *Eating and Weight Disorders : EWD*, *23*(1), 87–94. https://doi.org/10.1007/s40519-016-0304-6

Krieger, N. (2012). Methods for the scientific study of discrimination and health: An ecosocial approach. *American Journal of Public Health*, *102*(5), 936–944. https://doi.org/10.2105/AJPH.2011.300544

Krieglmeyer, R., & Deutsch, R. (2010). Comparing measures of approach–avoidance behaviour: The manikin task vs. two versions of the joystick task. *Cognition and Emotion*, *24*(5), 810–828. https://doi.org/10.1080/02699930903047298

Kuri Morales, P., Ruiz Matus, C., Jimenez Corona, M. E., Sánchez Días, M. del R., Jaramillo Navarrete, E., & Glora Hernandez, L. E. (2016). *Encuesta Nacional de Salud y Nutrición de Medio Camino*. México: INSP.

Lachaud, C. M., & Renaud, O. (2011). A tutorial for analyzing human reaction times: How to filter data, manage missing values, and choose a statistical model. *Applied Psycholinguistics*, *32*(02), 389–416. https://doi.org/10.1017/S0142716410000457

Langdon, J., Rukavina, P., & Greenleaf, C. (2016). Predictors of obesity bias among exercise science students. *Advances in Physiology Education*, *40*(2), 157–164. https://doi.org/10.1152/advan.00185.2015

Latner, J. D., Rosewall, J. K., & Simmonds, M. B. (2007). Childhood obesity stigma: Association with television, videogame, and magazine exposure. *Body Image*, *4*(2), 147–155. https://doi.org/10.1016/j.bodyim.2007.03.002

Le Chatelier, E., Nielsen, T., Qin, J., Prifti, E., Hildebrand, F., Falony, G., … Pedersen, O. (2013). Richness of human gut microbiome correlates with metabolic markers. *Nature*, *500*(7464), 541–546. https://doi.org/10.1038/nature12506

Lear, S. A., Hu, W., Rangarajan, S., Gasevic, D., Leong, D., Iqbal, R., … Yusuf, S. (2017). The effect of physical activity on mortality and cardiovascular disease in 130 000 people from 17 high-income, middle-income, and low-income countries: The PURE study. *The Lancet*, *390*(10113), 2643–2654. https://doi.org/10.1016/S0140-6736(17)31634-3

Lee, S., Kuk, J. L., Davidson, L. E., Hudson, R., Kilpatrick, K., Graham, T. E., & Ross, R. (2005). Exercise without weight loss is an effective strategy for obesity reduction in obese individuals with and without Type 2 diabetes. *Journal of Applied Physiology*, *99*(3), 1220–1225. https://doi.org/10.1152/japplphysiol.00053.2005

Lewis, R. J., Cash, T. F., Jacobi, L., & Bubb-Lewis, C. (1997). Prejudice toward fat people: The development and validation of the antifat attitudes test. *Obesity Research*, *5*(4), 297–307.

Lewis, S. (2011). A Qualitative Investigation of Obese Men's Experiences With Their Weight. *American Journal of Health Behavior*, *35*(4). https://doi.org/10.5993/AJHB.35.4.8

Li, Y., Wang, X., Lin, X., & Hajli, M. (2018). Seeking and sharing health information on social media: A net valence model and cross-cultural comparison. *Technological Forecasting and Social Change*, *126*, 28–40. https://doi.org/10.1016/j.techfore.2016.07.021

Lillis, J., Luoma, J. B., Levin, M. E., & Hayes, S. C. (2010). Measuring Weight Self-stigma: The Weight Self-stigma Questionnaire. *Obesity*, *18*(5), 971–976. https://doi.org/10.1038/oby.2009.353

Lillis, J., Thomas, J. G., Levin, M. E., & Wing, R. R. (2017). Self-stigma and weight loss: The impact of fear of being stigmatized. *Journal of Health Psychology*, 1359105317739101. https://doi.org/10.1177/1359105317739101

Liu, M., Wu, L., & Yao, S. (2016). Dose–response association of screen time-based sedentary behaviour in children and adolescents and depression: A meta-analysis of observational studies. *Br J Sports Med*, *50*(20), 1252–1258. https://doi.org/10.1136/bjsports-2015-095084

Lozano-Sufrategui, L., Carless, D., Pringle, A., Sparkes, A., & McKenna, J. (2016). " Sorry Mate, You're Probably a Bit Too Fat to Be Able to Do Any of These": Men's Experiences of Weight Stigma. *International Journal of Men's Health*, *15*(1). Retrieved from http://search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&autht

ype=crawler&jrnl=15326306&AN=114179373&h=7OFo6bAB%2F9O0vI9Hj87zIup%2B7gYJJumV4Z85ECyG9PSZrWLQCZN7EzoYmH0jlEhtNoFrqQFRGX%2B6B5mf2TrZyw%3D%3D&crl=c

Lydecker, J. A., Cotter, E. W., Palmberg, A. A., Simpson, C., Kwitowski, M., White, K., & Mazzeo, S. E. (2016). Does this Tweet make me look fat? A content analysis of weight stigma on Twitter. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity*, *21*(2), 229–235. https://doi.org/10.1007/s40519-016-0272-x

Lynagh, M., Cliff, K., & Morgan, P. J. (2015). Attitudes and Beliefs of Nonspecialist and Specialist Trainee Health and Physical Education Teachers Toward Obese Children: Evidence for "Anti-Fat" Bias. *Journal of School Health*, *85*(9), 595–603.

Lyons, R. (2011). The Spread of Evidence-Poor Medicine via Flawed Social-Network Analysis. *Statistics, Politics, and Policy*, *2*(1). https://doi.org/10.2202/2151-7509.1024

Major, B., Eliezer, D., & Rieck, H. (2012). The psychological weight of weight stigma. *Social Psychological and Personality Science*, *3*(6), 651–658.

Major, B., Hunger, J. M., Bunyan, D. P., & Miller, C. T. (2014). The ironic effects of weight stigma. *Journal of Experimental Social Psychology*, *51*, 74–80. https://doi.org/10.1016/j.jesp.2013.11.009

Major, B., Tomiyama, A. J., & Hunger, J. M. (2018). The Negative and Bi-Directional Effects of Weight Stigma on Health. In *The Oxford Handbook of Stigma, Discrimination, and Health* (pp. 499–519). New York, NY: Oxford University Press.

Manago, A. M., Ward, L. M., Lemm, K. M., Reed, L., & Seabrook, R. (2015). Facebook Involvement, Objectified Body Consciousness, Body Shame, and Sexual Assertiveness in College Women and Men. *Sex Roles*, *72*(1–2), 1–14. https://doi.org/10.1007/s11199-014-0441-1

Mastro, D., & Figueroa-Caballero, A. (2018). Measuring Extremes: A Quantitative Content Analysis of Prime Time TV Depictions of Body Type. *Journal of Broadcasting & Electronic Media*, *62*(2), 320–336. https://doi.org/10.1080/08838151.2018.1451853

McConnell, A. R., & Leibold, J. M. (2001). Relations among the Implicit Association Test, Discriminatory Behavior, and Explicit Measures of Racial Attitudes. *Journal of Experimental Social Psychology*, *37*(5), 435–442. https://doi.org/10.1006/jesp.2000.1470

Meltzer, D., Chung, J., Khalili, P., Marlow, E., Arora, V., Schumock, G., & Burt, R. (2010). Exploring the Use of Social Network Methods in Designing Healthcare Quality Improvement Teams. *Social Science & Medicine (1982)*, *71*(6), 1119–1130. https://doi.org/10.1016/j.socscimed.2010.05.012

Mensinger, J. L., & Meadows, A. (2017). Internalized weight stigma mediates and moderates physical activity outcomes during a healthy living program for women with high body mass index. *Psychology of Sport and Exercise*, *30*, 64–72. https://doi.org/10.1016/j.psychsport.2017.01.010

Millsap, R. E. (2011). *Statistical approaches to measurement invariance*. New York, NY, US: Routledge/Taylor & Francis Group.

Mischel, W., Shoda, Y., & Rodriguez, M. (1989). Delay of gratification in children. *Science*, *244*(4907), 933–938. https://doi.org/10.1126/science.2658056

Moors, A. (2014). Examining the Mapping Problem in Dual-Process Models. In *Dual-Process Theories of the Social Mind* (pp. 20–34). New York: The Guilford Press.

Moors, Agnes, & De Houwer, J. (2006). Automaticity: A Theoretical and Conceptual Analysis. *Psychological Bulletin*, *132*(2), 297–326. https://doi.org/10.1037/0033-2909.132.2.297

More, K. R., Phillips, L. A., & Eisenberg Colman, M. H. (2019). Evaluating the potential roles of body dissatisfaction in exercise avoidance. *Body Image*, *28*, 110–114. https://doi.org/10.1016/j.bodyim.2019.01.003

Morrison, T. G., & O'Connor, W. E. (1999). Psychometric properties of a scale measuring negative attitudes toward overweight individuals. *The Journal of Social Psychology*, *139*(4), 436–445. https://doi.org/10.1080/00224549909598403

Muraven, M., Gagné, M., & Rosman, H. (2008). Helpful Self-Control: Autonomy Support, Vitality, and Depletion. *Journal of Experimental Social Psychology*, *44*(3), 573–585. https://doi.org/10.1016/j.jesp.2007.10.008

Must, A., Spadano, J., Coakley, E. H., Field, A. E., Colditz, G., & Dietz, W. H. (1999). The Disease Burden Associated With Overweight and Obesity. *JAMA*, *282*(16), 1523–1529. https://doi.org/10.1001/jama.282.16.1523

Neumark-Sztainer, D., Falkner, N., Story, M., Perry, C., Hannan, P. J., & Mulert, S. (2002). Weight-teasing among adolescents: Correlations with weight status and disordered eating behaviors. *International Journal of Obesity and Related Metabolic Disorders: Journal of the International Association for the Study of Obesity*, *26*(1), 123–131. https://doi.org/10.1038/sj.ijo.0801853

Newman, M. E. J. (2016). *Networks: An introduction* (Reprinted). Oxford: Oxford University Press.

Nguyen, Q. C., Kath, S., Meng, H.-W., Li, D., Smith, K. R., VanDerslice, J. A., … Li, F. (2016). Leveraging geotagged Twitter data to examine neighborhood happiness, diet, and physical activity. *Applied Geography*, *73*, 77–88. https://doi.org/10.1016/j.apgeog.2016.06.003

Nishi, A., Christakis, N. A., & Rand, D. G. (2017). Cooperation, decision time, and culture: Online experiments with American and Indian participants. *PLOS ONE*, *12*(2), e0171252. https://doi.org/10.1371/journal.pone.0171252

Nishiwaki, M., Nakashima, N., Ikegami, Y., Kawakami, R., Kurobe, K., & Matsumoto, N. (2016). A pilot lifestyle intervention study: Effects of an intervention using an activity monitor and Twitter on physical activity and body composition. *The Journal of Sports Medicine and Physical Fitness*, *57*. https://doi.org/10.23736/S0022-4707.16.06208-3

O'Brien, K. S., Hunter, J. A., & Banks, M. (2007). Implicit anti-fat bias in physical educators: Physical attributes, ideology and socialization. *International Journal of Obesity*, *31*(2), 308–314.

O'Brien, K. S., Latner, J. D., Halberstadt, J., Hunter, J. A., Anderson, J., & Caputi, P. (2008). Do Antifat Attitudes Predict Antifat Behaviors? *Obesity*, *16*, S87–S92. https://doi.org/10.1038/oby.2008.456

OECD. (2017). *Obesity Update 2017*. Paris, France: OECD Directorate for Employment, Labour and Social Affairs.

Orben, A., & Przybylski, A. K. (2019). The association between adolescent well-being and digital technology use. *Nature Human Behaviour*, *3*(2), 173. https://doi.org/10.1038/s41562-018-0506-1

Oswald, F. L., Mitchell, G., Blanton, H., Jaccard, J., & Tetlock, P. E. (2013). Predicting ethnic and racial discrimination: A meta-analysis of IAT criterion studies. *Journal of Personality and Social Psychology*, *105*(2), 171–192. https://doi.org/10.1037/a0032734

Ouchi, N., Parker, J. L., Lugus, J. J., & Walsh, K. (2011). Adipokines in inflammation and metabolic disease. *Nature Reviews. Immunology*, *11*(2), 85–97. https://doi.org/10.1038/nri2921

Palmeira, L., Pinto-Gouveia, J., & Cunha, M. (2016). The role of weight self-stigma on the quality of life of women with overweight and obesity: A multi-group comparison between binge eaters and non-binge eaters. *Appetite*, *105*, 782–789. https://doi.org/10.1016/j.appet.2016.07.015

Panza, G. A., Armstrong, L. E., Taylor, B. A., Puhl, R. M., Livingston, J., & Pescatello, L. S. (2018). Weight bias among exercise and nutrition professionals: A systematic review: Weight bias in exercise and nutrition. *Obesity Reviews*, *19*(11), 1492–1503. https://doi.org/10.1111/obr.12743

Pearl, R. L., & Puhl, R. M. (2018). Weight bias internalization and health: A systematic review. *Obesity Reviews*. https://doi.org/10.1111/obr.12701

Pearl, R. L., & Dovidio, J. F. (2015). Experiencing weight bias in an unjust world: Impact on exercise and internalization. *Health Psychology*, *34*(7), 741–749. https://doi.org/10.1037/hea0000178

Pearl, R. L., & Puhl, R. M. (2014). Measuring internalized weight attitudes across body weight categories: Validation of the Modified Weight Bias Internalization Scale. *Body Image*, *11*(1), 89–92. https://doi.org/10.1016/j.bodyim.2013.09.005

Pearl, R. L., & Puhl, R. M. (2016). The distinct effects of internalizing weight bias: An experimental study. *Body Image*, *17*, 38–42. https://doi.org/10.1016/j.bodyim.2016.02.002

Pearl, R. L, Puhl, R. M., & Dovidio, J. F. (2015). Differential effects of weight bias experiences and internalization on exercise among women with overweight and obesity. *Journal of Health Psychology*, *20*(12), 1626–1632. https://doi.org/10.1177/1359105313520338

Peterson, J. L., Puhl, R. M., & Luedicke, J. (2012). An Experimental Assessment of Physical Educators' Expectations and Attitudes: The Importance of Student Weight and

Gender. *Journal of School Health*, *82*(9), 432–440. https://doi.org/10.1111/j.1746-1561.2012.00719.x

Phelan, J., Link, B. G., & Dovidio, J. F. (2008). "Stigma and Prejudice: One Animal or Two?" *Social Science & Medicine (1982)*, *67*(3), 358–367. https://doi.org/10.1016/j.socscimed.2008.03.022

Phelan, S. M., Dovidio, J. F., Puhl, R. M., Burgess, D. J., Nelson, D. B., Yeazel, M. W., … Ryn, M. van. (2014). Implicit and explicit weight bias in a national sample of 4,732 medical students: The medical student CHANGES study. *Obesity*, *22*(4), 1201–1208. https://doi.org/10.1002/oby.20687

Pinel, E. C. (1999). Stigma consciousness: The psychological legacy of social stereotypes. *Journal of Personality and Social Psychology*, *76*(1), 114.

Pratto, F., Sidanius, J., & Levin, S. (2006). Social dominance theory and the dynamics of intergroup relations: Taking stock and looking forward. *European Review of Social Psychology*, *17*(1), 271–320. https://doi.org/10.1080/10463280601055772

Pryor, J. B., Reeder, G. D., Yeadon, C., & Hesson-McInnis, M. (2004). A Dual-Process Model of Reactions to Perceived Stigma. *Journal of Personality and Social Psychology*, *87*(4), 436–452. https://doi.org/10.1037/0022-3514.87.4.436

Puhl, R., & Brownell, K. D. (2001). Bias, discrimination, and obesity. *Obesity*, *9*(12), 788–805.

Puhl, R. M., Andreyeva, T., & Brownell, K. D. (2008). Perceptions of weight discrimination: Prevalence and comparison to race and gender discrimination in America. *International Journal of Obesity*, *32*(6), 992–1000. https://doi.org/10.1038/ijo.2008.22

Puhl, R., & Suh, Y. (2015). Health Consequences of Weight Stigma: Implications for Obesity Prevention and Treatment. *Current Obesity Reports*, *4*(2), 182–190. https://doi.org/10.1007/s13679-015-0153-z

Puhl, R. M., & Brownell, K. D. (2006). Confronting and Coping with Weight Stigma: An Investigation of Overweight and Obese Adults. *Obesity*, *14*(10), 1802–1815. https://doi.org/10.1038/oby.2006.208

Puhl, R. M., & Heuer, C. A. (2009). The Stigma of Obesity: A Review and Update. *Obesity*, *17*(5), 941–964. https://doi.org/10.1038/oby.2008.636

Puhl, R. M., Himmelstein, M. S., & Quinn, D. M. (2018). Internalizing Weight Stigma: Prevalence and Sociodemographic Considerations in US Adults: Internalizing Weight Stigma. *Obesity*, *26*(1), 167–175. https://doi.org/10.1002/oby.22029

Puhl, R. M., Wall, M. M., Chen, C., Bryn Austin, S., Eisenberg, M. E., & Neumark-Sztainer, D. (2017). Experiences of weight teasing in adolescence and weight-related outcomes in adulthood: A 15-year longitudinal study. *Preventive Medicine*, *100*, 173–179. https://doi.org/10.1016/j.ypmed.2017.04.023

Puhl, R.M., Latner, J. D., O'brien, K. S., Luedicke, J., Danielsdottir, S., & Forhan, M. (2015). A multinational examination of weight bias: Predictors of anti-fat attitudes across four countries. *International Journal of Obesity*, *39*(7), 1166–1173.

Readdy, T., & Wallhead, T. L. (2016). Manifestation of Anti-Fat Bias in Preservice Physical Education Teachers. *The Physical Educator*, *73*(3), 450–470. https://doi.org/10.18666/TPE-2016-V73-I3-5954

Reilly, J., Jackson, D., Montgomery, C., Kelly, L., Slater, C., Grant, S., & Paton, J. (2004). Total energy expenditure and physical activity in young Scottish children: Mixed longitudinal study. *The Lancet*, *363*(9404), 211–212. https://doi.org/10.1016/S0140-6736(03)15331-7

Richetin, J., Costantini, G., Perugini, M., & Schönbrodt, F. (2015). Should We Stop Looking for a Better Scoring Algorithm for Handling Implicit Association Test Data? Test of the Role of Errors, Extreme Latencies Treatment, Scoring Formula, and Practice Trials on Reliability and Validity. *PLOS ONE*, *10*(6), e0129601. https://doi.org/10.1371/journal.pone.0129601

Robertson, N., & Vohora, R. (2008). Fitness vs. fatness: Implicit bias towards obesity among fitness professionals and regular exercisers. *Psychology of Sport and Exercise*, *9*(4), 547–557. https://doi.org/10.1016/j.psychsport.2007.06.002

Robinson, B. "Bean" E., Bacon, L. C., & O'reilly, J. (1993). Fat phobia: Measuring, understanding, and changing anti-fat attitudes. *International Journal of Eating Disorders*, *14*(4), 467–480. https://doi.org/10.1002/1098-108X(199312)14:4<467::AID-EAT2260140410>3.0.CO;2-J

Robinson, E. (2017). Overweight but unseen: A review of the underestimation of weight status and a visual normalization theory. *Obesity Reviews: An Official Journal of the International Association for the Study of Obesity*, *18*(10), 1200–1209. https://doi.org/10.1111/obr.12570

Rosen, H. (2014). Is Obesity A Disease or A Behavior Abnormality? Did the AMA Get It Right? *Missouri Medicine*, *111*(2), 104–108.

Rosseel, Y. (2012). *lavaan: An R Package for Structural Equation Modeling*. *48*(2), 1–36.

Rothblum, E. D., Miller, C. T., & Garbutt, B. (1988). Stereotypes of obese female job applicants. *International Journal of Eating Disorders*, *7*(2), 277–283. https://doi.org/10.1002/1098-108X(198803)7:2<277::AID-EAT2260070213>3.0.CO;2-2

Ryan, R. M., & Deci, E. L. (2008). From Ego Depletion to Vitality: Theory and Findings Concerning the Facilitation of Energy Available to the Self. *Social and Personality*

Psychology Compass, *2*(2), 702–717. https://doi.org/10.1111/j.1751-9004.2008.00098.x

Ryan, R. M., & Frederick, C. (1997a). On Energy, Personality, and Health: Subjective Vitality as a Dynamic Reflection of Well-Being. *Journal of Personality*, *65*(3), 529–565. https://doi.org/10.1111/j.1467-6494.1997.tb00326.x

Ryan, R. M., & Frederick, C. (1997b). On Energy, Personality, and Health: Subjective Vitality as a Dynamic Reflection of Well-Being. *Journal of Personality*, *65*(3), 529–565. https://doi.org/10.1111/j.1467-6494.1997.tb00326.x

Sabin, J. A., Marini, M., & Nosek, B. A. (2012). Implicit and Explicit Anti-Fat Bias among a Large Sample of Medical Doctors by BMI, Race/Ethnicity and Gender. *PLoS ONE*, *7*(11). https://doi.org/10.1371/journal.pone.0048448

Saint Pol, T. de. (2007). *L'obésité en France: Les écarts entre catégories sociales s'accroissent*. INSEE.

Salganik, M. J. (2017). *Bit by bit: Social research in the digital age*. Princeton, NJ: Princeton University Press.

Sampedro, J. G., Quiñones, I. T., Márquez, J. C., & Robles, Á. S. (2012). Actitudes hacia la obesidad de los estudiantes de Magisterio de la Universidad de Huelva. *Retos: Nuevas Tendencias En Educación Física, Deporte y Recreación*, (22), 38–42.

Santos-Lozano, A., Santín-Medeiros, F., Cardon, G., Torres-Luque, G., Bailón, R., Bergmeir, C., … Garatachea, N. (2013). Actigraph GT3X: Validation and Determination of Physical Activity Intensity Cut Points. *International Journal of Sports Medicine*, *34*(11), 975–982. https://doi.org/10.1055/s-0033-1337945

Sarsan, A., Ardiç, F., Özgen, M., Topuz, O., & Sermez, Y. (2006). The effects of aerobic and resistance exercises in obese women. *Clinical Rehabilitation*, *20*(9), 773–782. https://doi.org/10.1177/0269215506070795

Schmalz, D. L. (2010). 'I Feel Fat': Weight-Related Stigma, Body Esteem, and BMI as Predictors of Perceived Competence in Physical Activity. *Obesity Facts*, *3*(1), 15–21. https://doi.org/10.1159/000273210

Schmalz, D. L., & Colistra, C. M. (2016). Obesity Stigma as a Barrier to Healthy Eating Behavior: *Topics in Clinical Nutrition*, *31*(1), 86–94. https://doi.org/10.1097/TIN.0000000000000060

Schneider, W., & Shiffrin, R. M. (1977). Controlled and automatic human information processing. *I. Detection, Search, and Attention. Psychological Review*, 1–66.

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of Educational Research*, *99*(6), 323–338.

Schvey, N. A., Sbrocco, T., Bakalar, J. L., Ress, R., Barmine, M., Gorlick, J., … Tanofsky-Kraff, M. (2016). *The Experience of Weight Stigma Among Gym Members With Overweight and Obesity.* Retrieved from http://psycnet.apa.org/psycinfo/2016-45386-001/

Schwartz, M. B., Vartanian, L. R., Nosek, B. A., & Brownell, K. D. (2006). The Influence of One's Own Body Weight on Implicit and Explicit Anti-fat Bias. *Obesity*, *14*(3), 440–447. https://doi.org/10.1038/oby.2006.58

Seacat, J. D., & Mickelson, K. D. (2009). Stereotype threat and the exercise/dietary health intentions of overweight women. *Journal of Health Psychology*, *14*(4), 556–567.

Setchell, J., Watson, B. M., Gard, M., & Jones, L. (2016). Physical Therapists' Ways of Talking About Overweight and Obesity: Clinical Implications. *Physical Therapy*, *96*(6), 865.

Shearer, E., & Gottfried, J. (2017, September 7). News Use Across Social Media Platforms 2017. Retrieved February 22, 2018, from Pew Research Center's Journalism Project

website: http://www.journalism.org/2017/09/07/news-use-across-social-media-platforms-2017/

Sheets, V., & Ajmere, K. (2005). Are romantic partners a source of college students' weight concern? *Eating Behaviors*, *6*(1), 1–9. https://doi.org/10.1016/j.eatbeh.2004.08.008

Sherman, J. W., Gawronski, B., & Trope, Y. (2014). *Dual-Process Theories of the Social Mind*. New York: The Guilford Press.

Sibley, C. G., & Duckitt, J. (2008). Personality and prejudice: A meta-analysis and theoretical review. *Personality and Social Psychology Review: An Official Journal of the Society for Personality and Social Psychology, Inc*, *12*(3), 248–279. https://doi.org/10.1177/1088868308319226

Sidanius, J., & Pratto, F. (1999). *Social Dominance: An Intergroup Theory of Social Hierarchy and Oppression*. Cambridge, UK.: Cambride University Press.

Sinclair, S., Lowery, B. S., Hardin, C. D., & Colangelo, A. (2005). Social tuning of automatic racial attitudes: The role of affiliative motivation. *Journal of Personality and Social Psychology*, *89*(4), 583–592. https://doi.org/10.1037/0022-3514.89.4.583

Slonje, R., & Smith, P. K. (2008). Cyberbullying: Another main type of bullying? *Scandinavian Journal of Psychology*, *49*(2), 147–154. https://doi.org/10.1111/j.1467-9450.2007.00611.x

Smith, C. A., Schmoll, K., Konik, J., & Oberlander, S. (2007). Carrying Weight for the World: Influence of Weight Descriptors on Judgments of Large-Sized Women. *Journal of Applied Social Psychology*, *37*(5), 989–1006. https://doi.org/10.1111/j.1559-1816.2007.00196.x

Smith, E. E., Langston, C., & Nisbett, R. E. (1992). The Case for Rules in Reasoning. *Cognitive Science*, *16*(1), 1–40. https://doi.org/10.1207/s15516709cog1601_1

Smith, K. P., & Christakis, N. A. (2008). Social Networks and Health. *Annual Review of Sociology*, *34*(1), 405–429. https://doi.org/10.1146/annurev.soc.34.040507.134601

So, J., Prestin, A., Lee, L., Wang, Y., Yen, J., & Chou, W.-Y. S. (2016). What Do People Like to "Share" About Obesity? A Content Analysis of Frequent Retweets About Obesity on Twitter. *Health Communication*, *31*(2), 193–206. https://doi.org/10.1080/10410236.2014.940675

Stein, J., Luppa, M., Ruzanska, U., Sikorski, C., König, H.-H., & Riedel-Heller, S. G. (2014). Measuring Negative Attitudes towards Overweight and Obesity in the German Population – Psychometric Properties and Reference Values for the German Short Version of the Fat Phobia Scale (FPS). *PLOS ONE*, *9*(12), e114641. https://doi.org/10.1371/journal.pone.0114641

Strack, F., & Deutsch, R. (2004). Reflective and Impulsive Determinants of Social Behavior. *Personality and Social Psychology Review*, *8*(3), 220–247. https://doi.org/10.1207/s15327957pspr0803_1

Tajfel, H., & Turner, J. (1997). An Integrative Theory of Intergroup Conflict. In *The social psychology of intergroup relations* (p. 15). Monterey, CA.: Brooks/Cole.

Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High Self-Control Predicts Good Adjustment, Less Pathology, Better Grades, and Interpersonal Success. *Journal of Personality*, *72*(2), 271–324. https://doi.org/10.1111/j.0022-3506.2004.00263.x

Tankard, M. E., & Paluck, E. L. (2017). The Effect of a Supreme Court Decision Regarding Gay Marriage on Social Norms and Personal Attitudes. *Psychological Science*, *28*(9), 1334–1344. https://doi.org/10.1177/0956797617709594

Teachman, B A, & Brownell, K. D. (2001). Implicit anti-fat bias among health professionals: Is anyone immune? *International Journal of Obesity*, *25*(10), 1525–1531. https://doi.org/10.1038/sj.ijo.0801745

Teachman, Bethany A., Gapinski, K. D., Brownell, K. D., Rawlins, M., & Jeyaram, S. (2003). Demonstrations of implicit anti-fat bias: The impact of providing causal information and evoking empathy. *Health Psychology*, *22*(1), 68–78. https://doi.org/10.1037/0278-6133.22.1.68

Teixeira, P. J., Carraça, E. V., Marques, M. M., Rutter, H., Oppert, J.-M., De Bourdeaudhuij, I., … Brug, J. (2015). Successful behavior change in obesity interventions in adults: A systematic review of self-regulation mediators. *BMC Medicine*, *13*(1), 84. https://doi.org/10.1186/s12916-015-0323-6

Tiggemann, M., Churches, O., Mitchell, L., & Brown, Z. (2018). Tweeting weight loss: A comparison of #thinspiration and #fitspiration communities on Twitter. *Body Image*, *25*, 133–138. https://doi.org/10.1016/j.bodyim.2018.03.002

Tiggemann, M., & Slater, A. (2014). NetTweens: The Internet and Body Image Concerns in Preteenage Girls. *The Journal of Early Adolescence*, *34*(5), 606–620. https://doi.org/10.1177/0272431613501083

Tomiyama, A. J., Carr, D., Granberg, E. M., Major, B., Robinson, E., Sutin, A. R., & Brewis, A. (2018). How and why weight stigma drives the obesity 'epidemic' and harms health. *BMC Medicine*, *16*(1), 123. https://doi.org/10.1186/s12916-018-1116-5

Trayhurn, P. (2005). The biology of obesity. *Proceedings of the Nutrition Society*, *64*(1), 31–38. https://doi.org/10.1079/PNS2004406

Tremblay, L., Roy-Vaillancourt, M., Chebbi, B., Bouchard, S., Daoust, M., Dénommée, J., & Thorpe, M. (2016). Body Image and Anti-Fat Attitudes: An Experimental Study Using a Haptic Virtual Reality Environment to Replicate Human Touch. *Cyberpsychology, Behavior, and Social Networking*, *19*(2), 100–106. https://doi.org/10.1089/cyber.2015.0226

Valente, T. W. (2012). Network Interventions. *Science*, *337*(6090), 49–53. https://doi.org/10.1126/science.1217330

Valente, T. W., & Pumpuang, P. (2007). Identifying Opinion Leaders to Promote Behavior Change. *Health Education & Behavior*, *34*(6), 881–896. https://doi.org/10.1177/1090198106297855

Vartanian, L. R., & Novak, S. A. (2011). Internalized Societal Attitudes Moderate the Impact of Weight Stigma on Avoidance of Exercise. *Obesity*, *19*(4), 757–762. https://doi.org/10.1038/oby.2010.234

Vartanian, L. R., Pinkus, R. T., & Smyth, J. M. (2018). Experiences of weight stigma in everyday life: Implications for health motivation. *Stigma and Health*, *3*(2), 85–92. https://doi.org/10.1037/sah0000077

Vartanian, L. R., & Shaprow, J. G. (2008). Effects of weight stigma on exercise motivation and behavior: A preliminary investigation among college-aged females. *Journal of Health Psychology*, *13*(1), 131–138.

Visscher, T. L. S., Lakerveld, J., Olsen, N., Küpers, L., Ramalho, S., Keaver, L., … Yumuk, V. (2017). Perceived Health Status: Is Obesity Perceived as a Risk Factor and Disease? *Obesity Facts*, *10*(1), 52–60. https://doi.org/10.1159/000457958

Warburton, D. E. R., & Bredin, S. S. D. (2017). Health benefits of physical activity: A systematic review of current systematic reviews. *Current Opinion in Cardiology*, *32*(5), 541–556. https://doi.org/info:doi/10.1097/HCO.0000000000000437

Warburton, D. E. R., Nicol, C. W., & Bredin, S. S. D. (2006). Health benefits of physical activity: The evidence. *CMAJ : Canadian Medical Association Journal*, *174*(6), 801–809. https://doi.org/10.1503/cmaj.051351

Webb, F., Prentice, A., & Webb, F. (2006). Obesity amidst poverty. *International Journal of Epidemiology*, *35*(1), 24–30. https://doi.org/10.1093/ije/dyi204

Westerterp, K. R. (2019). Exercise for weight loss. *The American Journal of Clinical Nutrition*. https://doi.org/10.1093/ajcn/nqz070

Williams, D. R., Yan Yu, Jackson, J. S., & Anderson, N. B. (1997). Racial Differences in Physical and Mental Health: Socio-economic Status, Stress and Discrimination. *Journal of Health Psychology*, *2*(3), 335–351. https://doi.org/10.1177/135910539700200305

Wills, T. A., Isasi, C. R., Mendoza, D., & Ainette, M. G. (2007). Self-Control Constructs Related to Measures of Dietary Intake and Physical Activity in Adolescents. *Journal of Adolescent Health*, *41*(6), 551–558. https://doi.org/10.1016/j.jadohealth.2007.06.013

Wilson, T. D., Lindsey, S., & Schooler, T. Y. (2000). A model of dual attitudes. *Psychological Review*, *107*(1), 101–126. https://doi.org/10.1037//0033-295X.107.1.101

World Health Organization. (2010). *Global recommendations on physical activity for health.* Geneva: World Health Organization.

Zick, A., Pettigrew, T. F., & Wagner, U. (2008). Ethnic Prejudice and Discrimination in Europe. *Journal of Social Issues*, *64*(2), 233–251. https://doi.org/10.1111/j.1540-4560.2008.00559.x

Ziegert, J. C., & Hanges, P. J. (2005). Employment discrimination: The role of implicit attitudes, motivation, and a climate for racial bias. *The Journal of Applied Psychology*, *90*(3), 553–562. https://doi.org/10.1037/0021-9010.90.3.553

ANEXES

Supplemental materials: Study 1.

Community #1 (n = 142,448)			Community #2 (n = 41,220)			Community #3 (n = 11,837)			Community #4 (n = 12,349)		
Content	Count	%	Content	Count	%	Content	Count	%	Content	Count	%
exercise fitness	20,753	14.57%	exercise fitness	3,401	8.25%	exercise health	309	2.61%	exercise faith	1,157	9.37%
exercise fit	15,670	11%	healing healingmb	1,804	4.38%	can exercise	254	2.15%	christ exercise	1,144	9.26%
fit fitness	12,581	8.83%	practice surprising	1,377	3.34%	exercise fitness	254	2.15%	faith follow	1,139	9.22%
training workout	9,947	6.98%	exercise healingmb	1,183	2.87%	diet exercise	207	1.75%	follow forgives	1,139	9.22%
eatclean exercise	9,470	6.65%	healingmb health	1,166	2.83%	evidence exercise	200	1.69%	forgives god	1,139	9.22%
fitspo getfit	9,354	6.57%	thanks transform	1,157	2.81%	effects exercise	191	1.61%	jesus repent	1,139	9.22%
getfit gym	9,331	6.55%	exercise follow	1,141	2.77%	exercise get	165	1.39%	repent sins	1,139	9.22%
train training	9,324	6.54%	check customer	1100	2.67%	exercise help	159	1.34%	sins standards	1,139	9.22%
diet eatclean	9,314	6.54%	stressed stretch	1,083	2.63%	exercise great	154	1.30%	exercise force	334	2.70%
healthy healthychoices	9,281	6.51%	transform will	1,080	2.62%	exercise good	144	1.22%	exercise forces	182	1.47%

Supplemental table 1. Bigrams by community in the exercise-talk network.

Community #1 (n = 50,613)			Community #2 (n = 4,783)			Community #3 (n = 2,295)			Community #4 (n = 3,206)		
Content	Count	%	Content	Count	%	Content	Count	%	Content	Count	%
fast fat	4,479	8.850	ass fat	155	3.24	fat feel	108	4.71	cock fat	332	10.36
ways will	2,628	5.192	fat get	128	2.68	fat fucking	98	4.27	ass fat	297	9.26
diet fat	2,578	5.094	belly fat	115	2.40	fat fuck	88	3.83	lesbian movie	254	7.92
belly fat	2,051	4.052	fat fuck	102	2.13	even fat	78	3.40	fat full	227	7.08
secrets success	1,924	3.801	fat girl	79	1.65	eat fat	71	3.09	fat hot	147	4.59
burn fat	1,725	3.408	fat feat	78	1.63	eating fat	65	2.83	bbw belly	125	3.90
belly dangerous	1,603	3.167	even fat	73	1.53	disgusting fat	63	2.75	dick fat	121	3.77
click fat	1,507	2.977	drop fat	72	1.51	disorder eating	62	2.70	ass big	114	3.56
fat home	1,501	2.966	bitch fat	65	1.36	fat food	62	2.70	full gallery	112	3.49
eliminate fast	1,479	2.922	fat fool	58	1.21	fat hate	57	2.70	fatblly fatfetish	108	3.37

Supplemental table 2. Bigrams by community in the fat-talk network.

Description of themes by network and community

Exercise-talk Community #1

Fitness-related exercise tweets

The most common theme emerging from the bigrams and LDA analysis within the first community is the relationship between fitness, and fitness related words (e.g. workout, training and yoga) and exercise:

Example 1: RT @USERNAME: Cable chest press slow n controlled, forcing blood into the tissue for a major #pump #burn #gym #fit #fitness #fitchick

Example 2: RT @USERNAME: Daily #Running Day 48 #Adidas #Nike #Puma #KeepGoing #15krun #run #runner #15k #fitness #training #runnerslife #exercise

These kinds of tweets exhibit the relationship between physical abilities like endurance, strength, flexibility and agility, and the practice of exercise. They tend to be a report of goal fulfillment or positive feelings associated with the practice of physical activity.

Health-related exercise tweets

Another sub-topic that appears within the first community is that of exercise and health.

Example 1: RT @USERNAME: Why Strength Training Is so Important for Optimal Health [URL omitted] #IntermittentFasting #Keto #Exercise #Diet #LowCarb

Example 2: RT @USERNAME: Do you exercise enough to prevent heart disease? Only 1/2 of American adults exercise enough to benefit their health.

These tweets focus on the health benefits of exercise in a specific or general manner, generally providing external links for further information and in some cases the focus tends to be on nutritional advice in addition to exercise.

Both of the tweets found in this community resemble themes reported as common motivation for the practice of physical activity (Kilpatrick, Hebert, & Bartholomew, 2005).

Exercise-talk Community #2

Both fitness-related and health-related tweets appear in this community, however there is a small, third word sub-group that emerged:

English learning-related tweets

The use of the word exercise is also associated to repetitive goal-oriented tasks in the language learning context, therefore finding a cluster of accounts related to the teaching of English as a foreign language is not surprising.

Example 1: RT @USERNAME: Develop your English grammar with this exercise on expressing personal opinions: [URL omitted]

Example 2: RT @USERNAME: Grammar test: Give a try. #Grammar #Exercise

Exercise-talk Community #3

This cluster is mainly composed of health-related tweets, especially those pertaining cancer and stress.

Example 1: RT @USERNAME: Not only does exercise and eliminating sugar from your diet lead to weight loss, but it also may prevent colon cancer. [URL omitted]

Example 2: RT @USERNAME: Stressed? Stretching is a very effective way to relax #Exercise #StressReliever #Wellness [URL omitted]

Exercise-talk Community #4

Politics-related exercise tweets

Another cluster that isn't related to physical activity is the 4th one from the exercise network, in this case most of the tweets hold a relationship to military and air force exercises, and the exercise of rights particularly the second and first amendments of the United States.

Example 1: RT @USERNAME: @USERNAME sends aircraft carriers to western Pacific in rare military exercise following North Korea warning [URL omitted]

Example 2: RT @USERNAME: Philadelphia is the birthplace of the First Amendment. We exercise it, every day, on your behalf. [URL omitted]

Fat-talk Community #1

Weight loss-related fat tweets

The largest community within the fat-talk core network is related to the use of the word fat not so much as a macronutrient but as a bodily characteristic that can and should be burned or disposed of, mainly through diet but sometimes through exercise.

Example 1: RT @USERNAME: #StrengthTraining #Workouts Increase Your #Metabolism By Building Lean #Muscle, Greatly Enhancing #FatBurning [URL omitted]

Example 2: RT @USERNAME: Is "Cardio" Really Needed to Burn Extra Tummy Fat? Is Weight Training Better Than "Cardio"? [URL omitted]

Again, this tweets resemble common motives for the practice of physical activity as well as previous findings of a pro-thin effort of exercise promotion on Twitter (Kilpatrick et al., 2005; Lydecker et al., 2016).

Fat-talk Community #2

General weight stigmatization

The vast majority of this cluster of the fat-talk network uses the word fat in a negative connotation accompanied with generally negative terms:

Example 1: @USERNAME Look bitch your mother has a fat ass.

Example 2: RT @USERNAME: This Fat Girl Sent Me One Nude Picture And My 2GB data Expired When I Downloaded 10%. [URL omitted]

The attacks tend to be either un-directed or personal towards other users. They can be conveyed with a negative emotion or through humor. This findings have been previously reported in Twitter on several occasions although with deeper qualitative categories (Chou et al., 2009; So et al., 2016).

Fat-talk Community #3

Internalized stigma tweets

Tweets in the third community of the fat-talk community are mainly characterized by an internalization of stigma, generally expressing self-directed stigmatizing content:

Example 1: RT @USERNAME: ugh i just want to wear high waisted jeans without looking like a pig and serve cut looks but im so fat and disgusting

Example 2: RT @USERNAME: Let's get this straight. YOU ARE FAT. Do you really deserve to eat? Maybe if you'd stop shoveling food into your fatass.

Internalized stigma is the tendency to internalize and self-direct negative weight-based stereotypes, resulting in poor self-esteem or poor perceived competence (e.g., Hilbert et al., 2014). It is also worth noticing that the descriptions of some of the accounts in this cluster are

explicitly pro-eating disorders and fat phobic which is a fear of being overweight or obese (Woud, Anschutz, Van Strien, & Becker, 2011).

Fat-talk Community #4

Porn related tweets

Finally, the 4th cluster of the fat-talk group is mostly related to pornography, with explicit content and tweets referring to body parts or the actors as fat:

Example 1: RT @USERNAME: OVER 8 0 0 HOT FAT ASS VIDEO CLIPS!! [URL omitted]

Example 2: RT @USERNAME: @USERNAME shakes her fat ass [URL omitted]

Supplemental materials: Study 2 (translated to French).

	Pas du tout d'accord	Pas d'accord	Plutôt pas d'accord	Ni en désaccord ni d'accord	Plutôt d'accord	D' accord	Tout à fait d'accord
a - Les personnes grosses sont moins attirantes que les personnes minces.							
b - Je ne proposera jamais un rencard à une personne grosse.							
c - En général, les personnes grosses sont plus paresseuses que les autres.							
d - Les personnes grosses sont responsable de leur poids, elles ne peuvent s'en prendre qu'à elles.							
e - C'est dégoûtant de voir une personne grosse en maillot de bain sur la plage.							

Anti-Fat Attitude Scale-AFAS (Morrison & O'Connor, 1999).

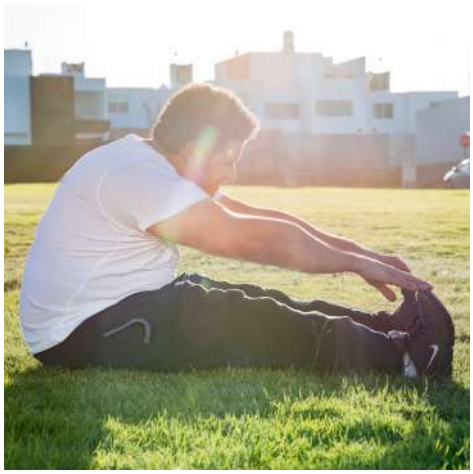
Imagine que tu es l'entraîneur sportif de cette personne, Quels types d'interactions penses tu que tu aurais avec elle?	Pas du tout d'accord	Pas d'accord	Plutôt pas d'accord	Ni en désaccord ni d'accord	Plutôt d'accord
1. – je l'aiderai ?					
2. – Je me moquerai d'elle ?					
3. - J'intéragirai avec elle ?					
4- Je l'encouragerai?					
5- Je l'ignorerai ?					
6- Je ferai des blagues sur elle ?					
7- Je lui parlerai ?					

Adapted aging stereotypes and exercise scale based on Clément-Guillotin, Radel, & Chalabaev, (2015) and Cuddy et al., (2007). This scale was repeated under four different conditions with the images bellow.

Female/thin condition

Female/overweight condition

Male/thin condition



Male/overweight condition

Supplemental materials: Study 3.

	French sample	Mexican sample	t-test/Chi-squared test
Sex			
Male	40% (80)	42.83% (64)	0.81
Female	60% (120)	58.17% (89)	0.81
BMI	23.55 (4.86)	25.34 (4.81)	3.45**
Underweight	6% (12)	1.96% (3)	0.11
Normal weight	67% (134)	53.59% (82)	0.05
Overweight	16.50% (33)	30.72% (47)	0.01*
Obese	10.50% (21)	13.72% (21)	0.45
Age	34.71 (16.08)	29.75 (10.80)	0.01*
Physical activity	301.54 (216.49)	286.18 (256.6)	-0.63
Subjective vitality	4.30 (1.18)	4.31 (1.31)	0.05
Motivation to Avoid Exercise	2.59 (1.65)	2.71 (1.44)	0.73
Perceived Weight	3.24 (1.4)	3.56 (1.33)	2.15
Weight Stigma Concerns	2.00 (1.4)	2.35 (1.64)	2.11
Perceived discrimination	1.30 (0.56)	2.47 (0.73)	16.45***
Weight Bias Internalization	2.55 (1.29)	2.77 (1.25)	1.67
N	200	153	-

Supplemental Table 3. Sample characteristics and scores with mean (SD) or % (N) as well as Bonferroni corrected t-tests and Chi-squared tests. *Note*: * $p<.05$, ** $p<.01$, *** $p<.001$.

	Mean	SD	α	1	2	3	4	5	6	7
1.- BMI	24.37	4.92	-							
2.- Physical Activity	296.39	226.79	-	-0.16**						
3.- Subjective Vitality	4.3	1.25	0.9	-0.14**	0.37***					
4.- Motivation to Avoid Exercise	2.64	1.55	0.77	0.25***	-0.28***	-0.33***				
5.- Perceived Weight	4.42	1.41	-	0.72***	-0.20***	-0.23***	0.31***			
6.- Weight Stigma Concerns	2.15	1.53	0.91	0.33***	-0.1	-0.21***	0.47***	0.39***		
7.- Perceived Discrimination	1.82	0.88	0.95	0.36***	-0.07	-0.11*	0.31***	0.32***	0.60***	
8.- Weight Bias Internalization	2.66	1.29	0.91	0.38***	-0.13*	-0.30***	0.54***	0.50***	0.68***	0.48***

Supplemental Table 4. *Means, standard deviations, Cronbach's alpha, and correlation matrix (N = 353). Note*: * $p<.05$, ** $p<.01$, *** $p<.001$.

	Estimate	Std. Error	t-value	p-value
Motivation to Avoid Exercise				
Model 1:				
Intercept	0.41	0.39	1.05	0.29
Perceived discrimination	0.34	0.22	1.58	0.12
Weight Bias Internalization	0.72***	0.13	5.60	< 0.001
Interaction	-0.06	0.06	-0.99	0.32
Total model	F (3, 350) = 49.79, p < 0.001, R2 = 0.29			
Model 2:				
Intercept	1.12***	0.32	3.55	< 0.001
Perceived discrimination	0.31	0.18	1.75	0.08
Weight Stigma Concerns	0.58***	0.12	4.78	< 0.001
Interaction	-0.06	0.05	-1.34	0.18
Total model	F (3, 350) = 33.87, p < 0.001, R2 = 0.2			
Model 3:				
Intercept	0.66*	0.29	2.29	< 0.05
Weight Bias Internalization	0.58***	0.11	5.22	< 0.001
Weight Stigma Concerns	0.31*	0.14	2.28	< 0.05
Interaction	-0.03	0.03	-0.96	0.34
Total model	F (3, 350) = 53.12, p < 0.001, R2 = 0.31			
Subjective Vitality				
Model 1:				
Intercept	4.81***	0.36	13.47	< 0.001
Perceived discrimination	0.17	0.20	0.87	0.39
Weight Bias Internalization	-0.26*	0.12	-2.18	< 0.05
Interaction	-0.02	0.05	-0.43	0.66
Total model	F (3, 350) = 10.46, p < 0.001, R2 = 0.07			
Model 2:				
Intercept	4.84***	0.28	17.26	< 0.001
Perceived discrimination	-0.07	0.16	-0.48	0.63
Weight Stigma Concerns	-0.28*	0.11	-2.62	< 0.05
Interaction	0.05	0.04	1.13	0.26
Total model	F (3, 350) = 4.91, p < 0.01, R2 = 0.03			
Model 3:				
Intercept	4.73***	0.26	17.86	< 0.001
Weight Bias Internalization	-0.17	0.10	-1.61	0.11
Weight Stigma Concerns	0.16	0.13	1.24	0.22
Interaction	-0.04	0.03	-1.38	0.17
Total model	F (3, 350) = 10.6, p < 0.01, R2 = 0.07			

Supplemental Table 5. Interaction between weight stigma processes.

Supplemental materials: Study 3

Questionaire Study 3 (french version):

1. Mesures anthropométriques:

Poids (en kg)
Taille (en cm)
Circonférence de la taille
(en cm)
(Ne complétez pas ce
champ si vous ne
possédez pas de ruban à
mesurer)
Mesure de la circonférence de la taille : avec un ruban à mesurer, au niveau du nombril

2. Nous nous intéressons aux différents types d'activités physiques que vous avez faites au cours des
7 derniers jours, au travail, dans votre maison ou votre jardin, pour vos déplacements, ou pendant
votre temps libre.
Considérons d'abord les **activités intenses**, c'est-à-dire celles qui vous demandent un effort physique
important et vous font respirer beaucoup plus difficilement que normalement, comme par exemple
porter des charges lourdes, bêcher, faire du VTT, courir, ou jouer au football.
Merci de penser seulement aux activités que vous avez effectuées **pendant au moins 10 minutes**
d'affilée.
Au cours des **7 derniers jours**, combien y a-t-il eu de jours pendant lesquels vous avez fait des
activités physiques intenses ?
Merci de ne pas inclure la marche.

3. En général (en moyenne), combien de temps avez-vous passé à pratiquer des **activités intenses** au
cours de l'un de ces jours ?
Indiquer une réponse en heures et en minutes, même approximative.
Exemples : Si une demi-heure par jour en moyenne, indiquer « 0 » heures et « 30 » minutes
Si 2 heures par jour en moyenne, indiquer « 2 » heures et « 00 » minutes

Heure(s) en moyenne par
jours
Minute(s) en moyenne
par jours
Je ne sais pas

4. Passons maintenant aux **activités modérées**, c'est-à-dire celles qui vous demandent un effort
physique modéré et vous font respirer un peu plus difficilement que normalement, comme par exemple
porter des charges légères, passer l'aspirateur, faire du vélo tranquillement, jouer au tennis en double
ou au volley-ball.

Pensez seulement aux activités que vous avez effectuées **pendant au moins 10 minutes d'affilée**.
Au cours des **7 derniers jours**, combien y a-t-il eu de jours pendant lesquels vous avez fait des
activités physiques modérées ?
Merci de ne pas inclure la marche.

5. En général (en moyenne), combien de temps avez-vous passé à pratiquer des **activités modérées**
au cours de l'un de ces jours ?

Heure(s) en moyenne par
jour
Minute(s) en moyenne
par jour
Je ne sais pas

6. Passons maintenant à **la marche**. Cela comprend la marche au travail ou à la maison, la marche
pour vous rendre d'un lieu à un autre, ou tout autre type de marche que vous auriez pu faire pendant
votre temps libre pour la détente, le sport, ou les loisirs.
Au cours des **7 derniers jours**, combien y a-t-il eu de jours pendant lesquels vous avez marché
pendant au moins 10 minutes d'affilée ?

7. En général (en moyenne), combien de temps avez-vous **marché** au cours de l'un de ces jours ?
Heure(s) en moyenne par
jour
Minute(s) en moyenne
par jour
je ne sais pas

8. Passons enfin au temps que vous avez passé **assis(e)** pendant **un jour de semaine** (sans tenir
compte du samedi et du dimanche), **au cours des 7 derniers jours.** Cela comprend le temps passé
assis(e) au travail, à la maison, lorsque vous étudiez et pendant votre temps libre. Il peut s'agir par
exemple du temps passé assis à un bureau, dans les transports, chez des amis, à lire, à être assis(e)
ou allongé(e) pour regarder la télévision ou utiliser un ordinateur (hors période de sommeil).
Au cours des **7 derniers jours**, combien de temps, en moyenne avez-vous passé **assis(e)** **pendant**
une journée habituelle (sans compter le samedi et le dimanche) ?

Heure(s) en moyenne par
jour
Minute(s) en moyenne

par jour
Je ne sais pas

9. A quel point chacune des phrases suivantes correspond aux sentiments généraux que vous avez éprouvés ces 7 derniers jours:

	Pas du tout	Très peu	Un peu	Moyennement	Assez	Fortement	Tout à fait
Je me suis senti(e) en pleine forme, plein(e) de vitalité.							
J'avais de l'énergie et de l'entrain.							
J'attendais chaque jour avec impatience.							
Je me suis senti(e) presque toujours vif(ve) et en forme.							
J'ai trouvé que j'avais beaucoup d'énergie.							

10. A quel point êtes-vous d'accord avec les propositions suivantes:

	Pas du tout d'accord	Très peu d'accord	Un peu d'accord	Moyennement d'accord	Assez d'accord	Fortement d'accord	Tout à fait d'accord
Je ne me sens pas à l'aise à l'idée d'aller dans une salle de sport où il y a beaucoup de miroirs.							
J'évite d'aller dans une salle de sport quand je sais qu'il y aura beaucoup de personnes minces.							
ça me gêne beaucoup de faire de l'activité physique dans des lieux publics (par exemple dans une salle de sport, marcher en public, nager dans une piscine publique...)							

Les questions suivantes portent sur vos perceptions et comportements vis-à-vis de votre poids. Nous vous rappelons que vos réponses sont anonymes et confidentielles. Merci de répondre le plus sincèrement possible.

11. Durant les 12 derniers mois, à quelle fréquence :

	Jamais	Rarement	De temps en temps	Souvent	Presque tout le temps
Avez-vous sauté des repas?					
Avez-vous jeûné (rien mangé) pendant 24h ou plus ?					
Avez-vous pris des pilules, des poudres ou des liquides amaigrissants sans recommandations/prescriptions médicales ?					
Vous êtes-vous fait(e) vomir ou avez-vous utilisé des laxatifs ou des diurétiques ?					
Avez-vous fumé des cigarettes pour vous couper la faim ?					
Avez-vous fait du sport ou des activités physiques de manière excessive, au point d'en avoir mal?					

Avez-vous fait du sport ou des activités physiques en utilisant des vêtements de sudation ?	
Avez-vous fait du sport ou des activités physiques pour vous autoriser des extras dans le domaine de l'alimentation ?	

12. En ce moment vous vous sentez...

1) extrêmement mince

2) modérément mince

3) un peu mince

4) Ni mince ni en surpoids

5) Un peu d'embonpoint

6) modérément en surpoids

7) extrêmement en surpoids

La dernière partie du questionnaire porte sur la façon dont vous vous sentez perçu(e) par les autres. Il n’y a pas de bonne ou de mauvaise réponse, merci de cocher pour chaque item la proposition qui correspond le mieux à ce que vous ressentez.

13. A quel point êtes-vous d'accord avec les propositions suivantes ?

	Pas du tout d'accord	Très peu d'accord	Un peu d'accord	Moyennement d'accord	Assez d'accord	Fortement d'accord	Tout à fait d'accord
Je redoute de ne pas être traité(e) équitablement à cause de mon poids.							
J'ai peur que les autres me rejettent à cause de mon poids.							
Quand j'interagis avec les autres, je crains d'être jugé(e) en fonction de mon poids.							

14. Durant les 12 derniers mois, à quelle fréquence:

	Jamais	Rarement	De temps en temps	Souvent	Presque tout le temps
avez-vous été traité(e) différemment des autres à cause de votre poids ?					
avez-vous été traité(e) avec moins de respect que les autres à cause de votre poids ?					
les autres vous ont traité(e) injustement à cause de votre poids ?					
les autres ont agi comme s'ils se sentaient supérieurs à vous à cause de votre poids ?					
les autres se sont moqués de vous ou vous ont importuné(e) à cause de votre poids ?					

15. A quel point êtes-vous d'accord avec les propositions suivantes :

	Pas du tout d'accord	Très peu d'accord	Un peu d'accord	Moyennement d'accord	Assez d'accord	Fortement d'accord	Tout à fait d'accord
Malgré mon poids, je me sens aussi compétent(e) que les autres.							
Je suis moins attirant(e) que les autres en raison de mon poids.							
Mon poids me rend anxieux(se) à cause de ce que les autres pourraient penser de moi.							
J'aimerais pouvoir radicalement changer mon poids.							
Lorsque je pense à mon poids, ça me déprime.							
Je me déteste à cause de mon poids.							
Mon poids est un élément central à partir duquel je juge ma valeur.							
A cause de mon poids, je ne pense pas que je mérite d'avoir une vie sociale épanouissante.							
Je suis satisfait(e) de mon poids.							
A cause de mon poids, je ne me sens pas moimême.							
A cause de mon poids, je ne vois pas comment quelqu'un d'attirant(e) voudrait sortir avec moi.							

16. Sexe:
Féminin
Masculin

17. Age:

18. Nationalité(s):

19. Quel(s) moyen(s) de transport(s) utilisez-vous quotidiennement ?

20. Quel est le diplôme le plus élevé que vous ayez obtenu ?

21. Quelle est votre profession,votre catégorie socio-professionnelle ?

22. Pourriez-vous indiquer le **revenu mensuel net avant impôt de votre foyer**, c’est-à-dire en comptant l’ensemble des ressources de votre foyer : les allocations familiales et les revenus professionnels de tous les membres du ménage y compris les heures supplémentaires, primes et 13ème mois, ainsi que les autres ressources financières de tous les membres du ménage : pension retraite, revenus fonciers mobiliers et immobiliers.
Parmi les tranches suivantes, dans laquelle se situe le revenu mensuel net avant impôt de votre foyer ?

Veuillez cliquer sur le bouton "suivant"

23. A quel moment avez-vous répondu aux questions concernant les mesures sur votre poids et votre
taille ?
Au début du questionnaire
A la fin du questionnaire

Nous vous remercions de votre participation et du temps que vous avez dédié à ce questionnaire.

Supplemental materials: Study 4

1. A quel point êtes-vous d'accord avec les propositions suivantes ?

	Pas du tout d'accord	Très peu d'accord	Un peu d'accord	Moyennement d'accord	Assez d'accord	Fortement d'accord	Tout à fait d'accord
Je redoute de ne pas être traité(e) équitablement à cause de mon poids.							
J'ai peur que les autres me rejettent à cause de mon poids.							
Quand j'interagis avec les autres, je crains d'être jugé(e) en fonction de mon poids.							

Weight stigma concerns scale Hunger and Major (2015)

2.- A quel point chacune des phrases suivantes correspond aux sentiments généraux que vous avez éprouvés ces 7 derniers jours:

	Pas du tout	Très peu	Un peu	Moyennement	Assez	Fortement	Tout à fait
Je me suis senti(e) en pleine forme, plein(e) de vitalité.							
J'avais de l'énergie et de l'entrain.							
J'attendais chaque jour avec impatience.							
Je me suis senti(e) presque toujours vif(ve) et en forme.							
J'ai trouvé que j'avais beaucoup d'énergie.							

Subjective Vitality Scale (Ryan & Frederick, 1997a)

Title: Weight Stigma's Relationship to the Practice and Maintenance of Physical Activity.

Abstract:
Obesity has been increasing worldwide for the last couple of decades. This increase has led to worldwide concern about the health of our population, prompting increases in health promotion programs that aim at improving lifestyle choices, like increasing the practice of physical activity. Even though physical activity is particularly beneficial for individuals with obesity, studies show that people with high BMI are less likely to practice it than those with low BMI. This is likely due to weight stigma. In the case of the targets of stigma current literature does not provide an understanding of the mechanisms by which stigma affects physical activity through its different processes. Moreover, studies on the perceiver perspective rarely examine behaviors and contextually relevant scenarios like social media. The main goal of this doctoral work is to understand how stigma affects the practice of physical activity at a macroscopic level (social media), an interpersonal level (perceivers), and an individual level (targets).Our findings suggest that current research on the perception of stigma limits the construct to face-to-face interactions and explicit discrimination ignoring social context. Specifically, social media could be a context where there is a clustering of stigmatizing communities overlapping with exercise promoting ones which could affect individuals receiving information from these websites. These communities are formed by people promoting weight loss and exercise, a population in which we found that weight stigma might influence intentions and automatic behaviors differently depending on type of stigma, intention, and sex of target. This could lead to escape-oriented behavior from stigmatized individuals, which depending on their resources, could have positive or negative effects on health. These results emphasize the importance of considering contextual information when exploring the effects of stigma on health. This doctoral dissertation also highlights avenues of research that should be explored in order to understand more accurately this relationship.

Keywords: Weight Stigma, Physical activity, Self-control, Implicit stigma, Motivation to Avoid Stigma, Social Media.