THE EVOLUTIONARY ORIGINS OF OBESITY STIGMA: THE ROLE OF DISGUST

By

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Submitted to the Psychology Department
School of Natural and Social Sciences
in partial fulfillment of the requirements
for the degree of Bachelor of Arts

Purchase College
State University of New York

April 2022

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Abstract

Obesity stigma affects around 650 million people worldwide, impacting their quality of life at work, at school, in healthcare settings, and in their personal relationships. Where does this stigma come from? Although social psychologists have argued that social norms, culturally specific beauty standards, and media messages are to blame for obesity stigma, I argue that evolutionary mechanisms are also partly responsible. In this theoretical review, I discuss how three evolutionary mechanisms may foster disgust reactions to obesity: (1) moral disgust (toward those who are viewed as working "less hard" or "free-riding"), (2) pathogen disgust (toward those who appear diseased or unwell), and (3) sexual disgust (toward those who are viewed as having greater reproductive risks). I ultimately propose that we may all have the innate capacity to feel disgusted under these 3 domains, but what exactly we may find disgusting is subjective to one's environment. By understanding the evolutionary mechanisms underlying obesity stigma, and the cultural cues that trigger these mechanisms, we are better equipped to alter our perceptions of those with obesity and build a more inclusive society.

The Evolutionary Origins of Obesity Stigma: The Role of Disgust

Obesity stigma affects the wellbeing of millions living with obesity. According to the Obesity Action Coalition (OAC), weight stigma can have serious social, psychological, and physical effects, such as: low self-esteem and negative body image, depression and anxiety, rejection by peers and family members, poor quality of personal relationships, lower pay at work and fewer promotions, harmful weight control practices (e.g., eating disorders), and exercise avoidance/sedentary behaviors (Vafiadis, 2022). In this paper, I review the prevalence of obesity and obesity stigma as an urgent social problem. Next, I will discuss the factors that give rise to this stigma; I argue that while social and cultural factors certainly contribute, evolutionary factors also drive this stigma in ways that are under-examined. I thoroughly investigate three evolutionary processes that may contribute to obesity stigma, specifically through the adaptive emotion of disgust. Finally, I offer some directions for future research and discuss the social implications of my evolutionary account.

Obesity and Obesity Stigmatization

Recent statistics show that 1 out of every 3 U.S. adults is obese (SingleCare Team, 2022), as is 13% of the world's adult population (World Health Organization, 2021). Obesity—defined as having a BMI (body mass index) over 30—is a chronic, complex disease, and a driver of non-communicable diseases (NCDs) (Arora et al., 2019). Once considered a high-income country problem, obesity is now on the rise in low- and middle-income countries, particularly in urban settings (World Health Organization, 2021).

Obesity stigma, or negative attitudes towards obese individuals, is an ongoing issue in the social world and affects millions living with obesity. Puhl and colleagues (2010) found that the

prevalence of weight discrimination has increased by 66% over the past decade and is now comparable to rates of racial discrimination in America (Puhl et al., 2010). A recent review paper found that these negative attitudes lead obese people to be deemed as lazy, free riders at a workplace, and/or cheaters of society (Puhl et al., 2010).

Through obesity stigma, we see an underlying accusatory issue where obese individuals are labeled "blameworthy" for their weight, when this may not always be the case. Weiner and colleagues first assessed the relationship between perceptions of personal responsibility (being blameworthy) and stigmatizing conditions and found that conditions rated low on personal responsibility (such as Alzheimer's disease, something uncontrollable) were rated high on liking and causing pity and intentions to help others. However, individuals with stigmatizing conditions rated high on personal responsibility (e.g., obesity and drug addiction) were disliked, evoked little pity and high anger, and received low ratings of helping tendencies (Puhl et al., 2010). Obesity can be caused by other health issues, certain medications, lower socioeconomic status, and a multitude of other factors, yet the stigma usually lies in the attribution perspective of obese individuals being obese because of their own actions (Balentine, 2022).

In contrast to assumptions that obesity stigma is entirely a product of U.S. culture, cross-cultural research has revealed obesity stigma amongst around 700 interviewed adults in 10 different countries (Brewis et al., 2011). This stigma was present in all ten cultures included in the study: American Samoa, Argentina, Iceland, Mexico, New Zealand, Paraguay, Puerto Rico, United Kingdom, United States and Tanzania. All ten cultures shared a blameworthy view of obesity, including the idea "that fat reflects personal and social failing" (Brewis et al., 2011). Evidently, obesity stigma exists amongst many if not most cultures around the world, not just the United States, contrary to popular belief.

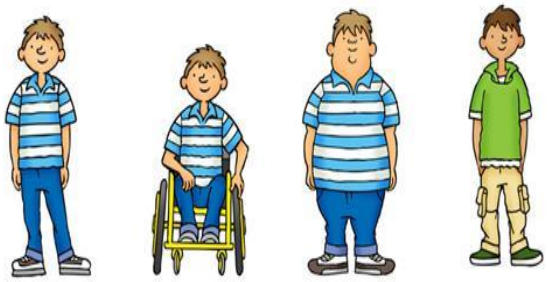


Figure 1. The Drawings of 'Alfie' (Healthy Weight, in a Wheelchair, Fat) and 'Thomas' (reproduced from Harrison et al., 2016).

In addition to cross-cultural research, developmental research on young children has also revealed the pervasiveness of obesity stigma. This research has found that children may be prejudiced against obese individuals beginning as early as age 4 (Harrison et al., 2016). Researcher Harrison and colleagues (2016) designed three versions of a simple story book about two friends, Alfie, and Thomas (see Figure 1). In one version, both Alfie and Thomas were "normal." In the other two versions, Thomas remained the same, but Alfie was either overweight or disabled. The books were read to 126 schoolchildren, ranging from 4 to 6 years old, who were then asked to rate Alfie and Thomas on several attributes. The procedure was repeated with female characters—Alfina and Holly—for another group of 150 children to control for gender. The results showed that children overwhelmingly viewed fat Alfie and wheelchair Alfie as less likely to win in a race against Thomas. Moreover, they also viewed fat Alfie as less likely to do well in school, to be happy with the way he looks, or to get invited to parties. They also rated him as more likely to be 'naughty' and as having fewer friends than Thomas to play with. Their "rejection" of the fat character was consistent for his female counterpart 'Alfina' and was not influenced by the children's gender.

Looking at cross-cultural and developmental research can provide insight into what features, or specialized brain mechanisms may be passed down evolutionarily from our ancestors. While cross-cultural or developmental findings do not indicate specialized brain

mechanisms *directly*, these findings of culturally consistent and early emerging obesity stigma indirectly suggest there may be evolutionary mechanisms at play. These evolutionary mechanisms magnify and interact with the fact that obesity stigma might be socially and culturally learned.

Origins of Obesity Stigma

(1) Social Origins of Obesity Stigma

Where did obesity stigma come from, or rather, when did it begin? Many people might say that the entertainment business, media, and social standards are the cause of obesity stigma. For example, characters in media with obesity are often shown overindulging in junk food and are less likely than thinner characters to be involved in romantic relationships or to be made the "love interest" (Heuer, 2010). "Fat Monica" on the hit show Friends is a great example; when Monica is thin, she's portrayed as attractive and lovable. But, when dressed in a fat suit, "Fat Monica" is portrayed as pathetic and not able to stop eating (Heuer, 2010). Even children's movies and programs communicate negative messages about being overweight or obese; studies show that overweight cartoon characters are often depicted as unattractive, unintelligent, unhappy, and cruel (Heuer, 2010). In 40% of children's movies, at least one character with obesity is disliked, and in over half of children's movies, a character with obesity is shown thinking about or eating food (Heuer, 2010). There is no denying that the media and entertainment business encourages obesity stigma by reinforcing clichés and normalizing humor towards obese individuals; obesity stigma is targeted towards adults and children. While I would not argue that these social factors do not reinforce or contribute to obesity stigma, I would argue

that focusing solely on social factors would be looking at the issue of obesity stigma through a narrow lens. In other words, *why* does the media portray obesity in this light? Where did obesity stigma come from *originally?*

(2) Evolutionary Origins of Obesity Stigma

As mammals and primates, humans can store body fat when consuming excess energy, such as overeating; however, during the millions of years of human evolution opportunities to overeat were rare (Bellisari, 2008). Ancestral hominins (species in the human line) faced food scarcity and had to engage in high levels of physical activity to live (Bellisari, 2008). Humans evolved elaborate and complex genetic and physiological systems to protect against starvation and defend stored body fat. However, in the last century, industrialization provided access to great quantities of mass-produced, high-calorie foods and many labor-saving and transportation devices such as vehicles, essentially ridding us of starvation and heavy labor (Bellisari, 2008). Through this, we understand that obesity is an occurrence of our present, not our past (Lieberman et al., 2012). So, how could evolutionary factors be responsible for an issue such as obesity stigma in modern times? The answer may lie in *cues*. Specifically, *disgust cues*.

(3) The Role of Disgust in the Evolutionary Origins of Obesity Stigma

Evolutionary psychologists may suggest our minds are currently wired similarly to our ancestors due to natural selection and survival; they also suggest we have maintained certain specialized brain mechanisms from our ancestors that generally made them more likely to survive (or "fit"). If we still hold these specialized brain mechanisms, we are responding to modern day environments while still solving the adaptive problems from our ancestors which

may affect our thoughts, emotions, and behaviors. The emotion of disgust, for example, is suggested to be a natural survival instinct and has been said to evolve as a way of telling our brain to actively avoid any object that resembles a pathogen (Renner, 2021). Disgust is a universal emotion that allows us to assume it is an innate emotion and a tactic for survival; the scrunched-up expression is a response to a bad smell or taste, as it reduces odors and particles coming in through the nose and mouth (Danovitch & Bloom, 2009; Strickland, 2009). Elwood and Olatunji (2009) reviewed cross-cultural research examining disgust amongst many different cultures. They concluded that participants across cultures have consistently paired the disgust emotion with the disgust facial expression, which provides support for the universal experience of the disgust emotion (Elwood & Olatunji 2009). Providing additional support for the universality of the disgust emotion, the few studies comparing the physiology related to disgust between cultures have suggested that the physiological reaction is similar across cultures; I believe this may allude to disgust being early emerging, foundational, and possibly innate.

Traditionally, we experience disgust when encountering something that would be detrimental to our health or the likelihood of survival. Tara Cepon-Robins, an expert in parasites, set out to study how culture, environment, and emotion influence the ways humans shield their bodies from disease. To better understand disgust's evolutionary purpose, researchers had to study it in a high-pathogen environment that more closely resembled how our ancestors lived (Renner, 2021). To do so, they studied the indigenous Shuar people of Ecuador and Brazil. Some of the Shuar participants lived in traditional huts with dirt floors, while others lived in houses with concrete floors and metal roofs. Many participated in activities such as hunting and fishing which brought them in contact with possible pathogens, including roundworms and whipworms, which thrive in contaminated soil (Renner, 2021). Cepon-Robins surveyed 75 participants about

what disgusted them, and the researchers collected blood and fecal samples from the participants and compared their health to their level of disgust. As the scientists reported this February in *Proceedings of the National Academy of Sciences*, the individuals who scored highest in disgust sensitivity had the fewest viral and bacterial infections (Renner, 2021). This research highlights that disgust may have proved extremely beneficial in ancestral environments when pathogen levels were extremely high and modern medicine was non-existent.

In addition to disgust reactions to pathogens, disgust is also a common response to social or moral violations. If a crime is committed, we may say that the act was “disgusting,” and this may be a similar reaction to immoral behaviors in general such as “rape, murder, and theft” (Tybur et al., 2009). Suggested by researcher Hanah Chapman in Strickland’s article (2009) when these new forms of social disgust evolved, facial expressions associated with disgust and pathogen resistance may have simply tagged along with the brain mechanism, as suggested by researcher (Strickland, 2009). Chapman speculates that moral revulsion evolved out of more primal forms of disgust to help people avoid untrustworthy individuals; she states, "disgust is an avoidance mechanism at heart” (Strickland, 2009).

Among all emotions that could be tied to obesity stigma, there is an overwhelming reaction of disgust expressed in reaction to obese individuals. This is seen in countless research articles; specifically, one experiment by Vartanian and colleagues (2016) had half of the participants view a woman’s body before losing body fat, and the other half of participants view the same woman’s body after losing fat (Vartanian et al., 2016). All participants evaluated that woman on several dimensions (emotions, attitudes, stereotypes, desire for social distance). Compared with the non-obese target, the obese target elicited more disgust than any other

emotion (e.g., anger), in addition to more negative attitudes and a greater desire for social distance (Vartanian et al., 2016).

The present proposal

I propose that obesity stigma could be partially stemming from specialized mechanisms within our brains that have evolved to recognize visual cues (i.e., visual cues of obese individuals) responsible for eliciting disgust as a survival tactic. There are three specific domains of disgust that I will examine regarding obesity stigma: (1) moral disgust/dyadic cooperation, (2) pathogen resistance, and (3) sexual disgust. I will review the literature on these three forms of disgust reactions to obesity, drawing from developmental, cross-cultural, and mainly evolutionary research.

Disgust Domain I: Moral Disgust

One domain of disgust is moral disgust; moral disgust is triggered by moral violators such as cheaters of society, racists, and murderers (Danovitch & Bloom, 2009). Research on dyadic cooperation (or two-person cooperation) suggests that moral disgust emerges when individuals are viewed as cheating, "free-riding," or exploiting cooperative partners (Van Leeuwen et al., 2015). If a person is recognized as being immoral, and from that an uncooperative behavior, in evolutionary terms these characteristics of an individual would be detrimental to group survival, cooperation, and working together in a larger group scale or in a dyadic cooperation.

How might obesity trigger moral disgust? One possibility is that individuals may learn to associate obesity with limited economic resources, which may in turn lead them label obese

individuals as poor dyadic cooperators. In developed countries, obesity tends to be associated with low socioeconomic status (Van Leeuwen et al., 2015). Another possibility is that obesity may be perceived as a cue for unpredictability. To the extent that a perceiver believes that obesity is controllable and will associate obesity with fitness costs, obesity might be interpreted as an indicator of unpredictable goals; additionally, moral disgust reactions are particularly strong when people are viewed as being intentionally exploitative. Under these accounts, obese individuals may be viewed as "cheaters" of society; their physical state indicates that they work "less hard" than others. Moreover, most people view obesity as controllable and thus blame obese individuals for their state (Pearl & Lebowitz, 2014).

Some researchers suggest we have even evolved a specialized mechanism within our brains to detect cheaters. Research conducted by Cosmides and Tooby (2005) speaks on the detection of cheaters, and how cheaters may threaten the evolution of exchange. Social contracts are created and offered because the provisioner will expect to benefit if the conditions they have are satisfied. However, the only way to have social exchange survive through natural selection and evolution, we must obtain design features that allow us to detect cheaters. I suggest it could be that our specialized mechanisms to detect cheaters are generally used while observing obese individuals due to "immoral" behavior, and thus increasing stigmatization. For example, an obese individual doing manual labor may be perceived as a free rider due to receiving the same level of pay while contributing 'less work' because of their lower physical fitness, which may be viewed as unequal contribution in a social group (Van Leeuwen et al., 2015).

Many researchers have debated on whether moral disgust is taught to us through society rather than an innate response. This could make sense if the term "disgust" could be turned into a metaphor of some sort, applied to moral violations, and taught to us from a young age. For

example, a mom could tell a child, "A friend taking your crayon is *disgusting*." While this seems possible, studies conducted by Danovitch and Bloom (2009) argue that it would be hard for a child around age 6 to have an idea of what a metaphor is, or even what disgust really is, and apply it to moral violations (Danovitch & Bloom, 2009). The results showed that children as young as age 6 rated moral violations as disgusting, just as the older children did. In fact, children ranging from 6 to 10 years of age had almost an equal amount of disgust reactions to immoral events. Children as young as age six also paired a man making a disgusted face with a story about an immoral event, choosing it as an appropriate reaction to the story. Notably, the children, even the youngest children at age 6, labeled immoral events as disgusting, but did not label merely negative events as disgusting (i.e., watching a sad movie with a friend). Thus, the disgust reaction to moral violations may be understood as more of a natural and innate reaction rather than a metaphor that children must learn to apply (though it is still possible this reaction may have been learned earlier than age six). This is very good supportive evidence of disgust reactions to immoral events possibly being foundational or early emerging.

How do disgust reactions to immoral events relate to disgust reactions towards obese individuals? Well, some researchers suggest one of the reasons why we have disgust reactions towards obese individuals is because they are "cheating" in our society by doing less work yet receiving the same treatment as another who is working harder, which is ultimately immoral (Van Leeuwen et al, 2015). Van Leeuwen and colleagues discuss how obese individuals may be viewed as cheaters, exploitative, and immoral, making them costly as partners or in a social group as they would be imposing high fitness costs on the other individuals of the group. For example, if an obese individual is deemed as immoral, immoral acts may be detrimental to the group on a larger scale. In an article by Vartanian and colleagues (2016) they state that obesity

might be seen as a degradation of the self, and the behaviors that would make a person obese (e.g., overindulgence, laziness) may be seen as immoral behaviors, thus giving rise to a disgust response toward individuals who are obese (Vartanian et al., 2016).

If obesity is viewed as blameworthy and an act of self-degradation may perceive obesity to be a cost to society in terms of healthcare which could escalate obesity stigma overall. The root of obesity stigma, according to researcher Monika Arora and colleagues, lies heavily on a lot of people not recognizing obesity as a chronic disease, but rather a result or consequence of one's own actions (Arora et al., 2019). In relation to obesity being viewed because of one's own actions, a study conducted by Bernard and colleagues (2019) aimed to investigate the public's opinion about whether people with obesity should pay a higher health care contribution than people of normal weight almost as a "consequence of one's own actions" (Bernard et al., 2019). Results showed that participants suggest a significantly higher contribution towards health insurance for people with obesity compared to people with normal weight (Bernard et al., 2019). Although it is not directly addressed in connection to disgust, this evidence may contribute to moral disgust towards obese individuals as it is in line with "immoral" behavior—having society "pay" for something one did to themselves.

Similarly, another article explores the idea that obese individuals may be deemed immoral because they are seemingly actively choosing to do something detrimental to their health (Ringel & Ditto, 2019). Ringel and Ditto's research (2019) also explores the same idea of the costliness of obese individuals would be detrimental to the group and interfere with the survival of the group (Ringel & Ditto, 2019). Their first study consisting of survey questions found that greater moralization of obesity was strongly associated with control attributions for obesity and greater disgust (Ringel & Ditto, 2019). These findings suggest that associating

immorality with obesity is also associated with greater belief in control over obesity, as well as greater disgust towards obese individuals. This research also suggests that the disgust reaction in general to obese individuals including the other two domains of pathogen disgust and sexual disgust may intensify or make individuals have moral judgments against obese individuals; this proposal may explain why some groups of individuals are more heavily stigmatized than others.

In sum, there is a wide range of evidence that suggests disgust may be a natural response to moral violations. If obese individuals are generally labelled as immoral which has been found through a plethora of research, people may develop a disgust response to obese individuals under the domain of moral disgust, and in turn, this may possibly increase obesity stigma. While it has been assumed by many evolutionary psychologists that the elicitation of disgust in this manner may be a result of an avoidance tactic for cheaters, un-cooperative partners, or unreliable partners, it cannot be explicitly and fully supported without further experimental research.

Disgust Domain II: Pathogen Disgust

Another domain of disgust that relates to obesity stigma is pathogen disgust or pathogen resistance. Pathogen resistance is beneficial for the individual, as recognizing pathogens with a disgust reaction following will likely ensure a higher survival rate. Pathogen disgust evolved as a method of avoiding detrimental substances to our health such as pathogens; it is an emotion produced by our mind telling us, “Get away from that, it will get you sick!” Multiple studies suggest that obese individuals may unlock cues of illnesses and disease; humans possess pathogen-avoidance mechanisms that respond to the visual perception of structural irregularity in others (Park et al., 2007). If we process a visual cue of an obese individual such ass fatty tissue as an irregularity, we may process a harmless cue (fatty tissue) as something potentially

"harmful," such as a tumor. Van Leeuwen (2015) discussed results from a study by researchers Miller and Maner (Miller & Maner, 2012) that showed individuals with heightened pathogen concerns categorized average-weight individuals as obese. This is strong support of pathogen resistance being a responsible domain of disgust from an evolutionary perspective regarding obesity stigma; these results may suggest that participants with heightened pathogen concerns were on an extreme "high alert" in labelling cues of pathogens, so much so that perhaps any small cue of structural irregularity shown in the experimental images of the study was processed as a pathogen, and then falsely categorized as obese.

Another theory on the origin of disgust to pathogens and how we exercise it in our modern-day is the "behavioral immune system" – a phrase coined by Mark Schaller. The system refers to a group of psychological mechanisms that allow individual organisms to detect the potential presence of infectious parasites or pathogens in their immediate environment, and to engage in behaviors that prevent interaction with said pathogens (Schaller, 2015). Schaller states that disgust is triggered by physical cues that resemble pathogens (for example, a yellow liquid resembling puss would be more off-putting than a blue liquid). We develop, through evolution, psychological defenses that facilitate or create behavioral defenses. These behavioral defenses are created to avoid pathogens due to immunological shortcomings. Without behavioral defenses, we would most likely be sick frequently. Schaller (2015) explains that the affective experience of disgust is particular to pathogens due to numerous observations such as pathogens creating the feeling of disgust and no other negative feelings like fear. Also, humans are more inclined to be more disgusted under the circumstances of benefiting from pathogen avoidance such as picky eating during pregnancy. Our behavioral immune system is so elaborate that we have created an error management theory which refers to humans having false-positive than

false-negative errors which acts as a defense mechanism against pathogens (“better safe than sorry” analogy) (Schaller, 2015). Schaller also discussed prejudice and xenophobia's connection to the avoidance of pathogens. Schaller suggests that foreign objects or people are possible processed as being related to foreign pathogens that we may view as harmful, which may partially contribute to xenophobia (Schaller 2015). If xenophobia partially exists due to pathogen avoidance as Schaller suggests, this may unfortunately be true for obese individuals as a group. Schaller’s behavioral immune system could be seen as a foundational system to pathogen disgust, even in relation to obese individuals.

Evolutionary psychologists believe obese individuals may present physical cues of pathogens for a couple of reasons; their extra tissue may cue for deformities (Van Leeuwen et al., 2015). Others suggest deviations from average sizes cue for infectious diseases or mutations; Lieberman and colleagues (2011) also note this prevalent societal idea or assumption that obese individuals do carry more infectious diseases which may subconsciously affect one’s view on obese individuals as “pathogen carriers” (Lieberman et al., 2011). It is noted by Van Leeuwen and colleagues (2015) that poor hygiene is an association with obesity, which is a stereotype (Van Leeuwen, 2015; Vartanian & Silverstein 2013). Results from Lieberman and colleagues' study in 2011 showed that women with higher pathogen sensitivity had more negative attitudes towards obese individuals; this could very well be tied to any male partner with disease as being costly to women who would have to bear a child for 9 months; their fitness costs are higher and therefore must be more selective with partners. (Lieberman et al., 2011). Similarly, a study by Park and colleagues (2007) investigated whether obesity may trigger pathogen avoidance mechanisms (Park et al., 2007). Study 1 revealed that people who are highly concerned about pathogen transmission have more negative attitudes toward obese people; this effect was

especially prominent following visual exposure to obese individuals (Park et al., 2007). Overall, there is strong evidence supporting that obesity stigma may be tied to evolutionary cues of pathogen avoidance, thus causing disgust and resistance.

Disgust Domain III: Sexual Disgust

The last domain of disgust in relation to obesity stigma is sexual disgust. Sexual disgust is an emotion hypothesized to deter individuals from engaging in sexual activities that are detrimental to fitness (Crosby et al., 2020); some researchers have tied sexual disgust towards obese individuals to evolutionary roots. Lieberman and colleagues (2011) suggested many explanations centering around the lower fitness of offspring with an obese individual, and the costliness of mating with an obese individual that would inherently affect the offspring. Sexual disgust towards obese individuals was investigated by researcher Lieberman and colleagues in their 2011 study where he asked a pool of undergraduate participants their general level of sexual disgust and then their sexual disgust towards obese individuals. In study 1, researchers found that in order from greatest to least, disgust reactions to obesity were sex-related (1), pathogen-related (2), and lastly, moral-related (3). Their results show strong support in there being an existent sex-related disgust reaction to obese individuals in comparison to the other two domains of disgust. In study 2, researchers wanted to measure their personal general sensitivity or disgust to sexual acts to understand how this might influence their sexual disgust to obese individuals. The results showed that surprisingly, greater sexual disgust predicted less anti-obesity stigma; the researcher suggested this may be the case because individuals with a high sensitivity to sexual disgust do not engage in sexual acts as often, and therefore have no preference nor bias towards or against individuals of any “shape” (Lieberman et al., 2011). Crosby and colleagues (2020) propose one

section of sexual disgust is in relation to poor hygiene–and I propose this can be intertwined with pathogen disgust (Crosby et al., 2020). This could support this idea, once again, of the three domains of disgust influencing each other to create strong stigmatization towards obese individuals.

There is also existing research that gives more insight into a disfavor for obese individuals as a sexual partner amongst the general population. A study conducted by Chen and Brown (2005) investigated if there was a preference for healthy individuals in comparison to obese and dis/abled individuals when looking for a sexual partner (Chen & Brown, 2005). The researchers found that participants (who were psychology students at the University of Washington) favored obese individuals as a sexual partner the least; both men and women ranked the obese partner as least liked. In comparing mean rankings between genders, however, it was found that men ranked the obese partner as significantly less preferred than women did; based on this research, men are more likely to choose sexual partners based on weight in comparison to women. While this study does support that obesity stigmatization affects how we choose sexual partners, it does not concretely examine a disgust reaction to obese individuals in a potentially sexual relationship.

Some cross-cultural evidence supports the notion that lower BMIs are considered generally more “attractive” in women. In a study by Wang and colleagues (2015), participants from three Caucasian populations (Austria, Lithuania, and the UK), three Asian populations (China, Iran and Mauritius) and four African populations (Kenya, Morocco, Nigeria and Senegal) rated attractiveness of a series of female images varying in fatness (BMI) and waist to hip ratio (WHR) (Wang et al., 2015). There was an inverse linear relationship between physical attractiveness and body fatness or BMI in all populations (Wang et al., 2015). Lower body fat

was more attractive, down to at least a BMI of 19. WHR was a significant independent but less important factor, which was more important in African populations (Wang et al., 2015). With this evidence, it is hard to conclude that there is a sexual disgust reaction to obese individuals; there can just be an underlying preference for women with smaller BMIs which does not conclude a disgust reaction to obese individuals. Aspects of the female body may be attractive because they signal evolutionary fitness; greater body fatness might reflect greater potential to survive famines, but individuals carrying larger fat stores may have poor health and lower fertility in non-famine conditions. One review article by Grammer and colleagues (2003) stated regarding females judging males, we mainly find negative aspects in judgments: male bellies and male overall fatness are judged as unattractive (Grammer et al., 2003). Men and women are typically attracted to symmetry and are attracted to a certain WHR in women. Also, either extreme (high or low BMI) is found to be generally unattractive; ultimately, averageness (average BMI) and strong sex markers such as WHR in women. For men, broad shoulders, strong jawlines, and muscles are deemed as attractive and cues of fitness for optimal and healthy offspring (Grammer et al., 2003). The article claims that on an evolutionary basis, asymmetry can signal mutations in genes which would not be beneficial to offspring, thus making symmetrical faces and bodies more attractive. Similarly, averageness is an evolutionary reflection of gene state in that averageness may reflect heterozygosity which is a predictor of a strong immune system and genetic diversity which would result in less possible mutations. If this is true, perhaps obese individuals are being cued and processed as deviant from “average and symmetrical,” and in return, costly to offspring. Though knowing bodily preferences in potential mates can be useful in uncovering the origins of obesity stigma, preferences do not explain if

there is also a *disgust* reaction or aversion to the non-preferred body type, and it is hard to assume without further research.

Ultimately, the proposition of why obesity stigma exists under the sexual disgust domain is still unknown, though Lieberman and colleagues' theory is strong. Though it would be logical through an evolutionary lens for women to have stronger disgust reactions towards potential sexual partners who are obese due to greater reproductive risks, it has been more recurringly found that men tend to hold stronger biases against potential sexual partners who are overweight or obese. Perhaps conducting another study or multiple studies on women's disgust reactions to potential sexual partners could evaluate if the findings in Lieberman and colleague's study were a fluke (greater sexual disgust sensitivity predicted less anti-fat bias). Perhaps investigating whether greater pathogen disgust sensitivity and sexual disgust towards obese individuals are related would be more appropriate for Lieberman's hypothesis on greater reproductive risks in an obese sexual partner due to possible diseases an obese individual may carry. A disgust reaction may represent a more innate or foundational reaction that may support a potential evolutionary hypothesis on mate selection, as opposed to the stigma being socially learned under the sexual disgust domain.

Room for Alteration: Influences of Life Experience, Exposure, and Culture on Obesity Stigma

It is imperative to acknowledge what may be sculpting our innate capacity for disgust, what we then find disgusting in the world, and how that may affect our thoughts and behaviors towards ideas or people. There may be many factors that can predict certain levels of disgust towards obese individuals due to evolutionary cues instilled within us. I argue that culture,

exposure, and life experience can either enhance or alter the innate disgust feature we have, and thus altering our perceptions toward obese individuals. Enough supportive evidence exists to hypothesize that exposure, culture, and life experiences may change perspectives of obesity individuals regarding the three domains (moral, pathogen, and sexual disgust). For example, exposure to obese individuals in an experiment made women more inclined to be attracted to obese men than average sized men (Robinson & Christiansen, 2015). In Studies 1 and 2, the researchers examined the effect that exposure to obese vs healthy weight men had on female attraction toward an overweight man. Study 3 examined whether females who are regularly exposed to males of heavier body weights reported a greater attraction toward overweight men. Study 4 tested whether females in an online dating study were more likely to choose to date an overweight man, after having been exposed to obesity. Results showed that exposure to obesity altered visual perceptions of what normal and healthy body weights were and this resulted in greater attraction toward an overweight man. Females regularly exposed to men of heavier body weight reported a greater attraction toward overweight men (Robinson and Christiansen, 2015). After exposure to obesity, females in an online dating study were more likely to choose to date an overweight man ahead of a healthy weight man. This study could support that exposure and perhaps deconstruction and reconstruction of the misconceptions attached to obese individuals can alter our perceptions, and maybe even our innate disgust reactions to visual cues. Additionally, this study may have created a new “normal environment” for the women which may have altered what they viewed as low, average, and high body weight; this could speak on the research suggesting a general attraction for average weight individuals. “Averageness” may indeed alter per individual in respect to their environments. For example, if someone had grown up in a community of individuals with high BMIs, what they view as average weight and what

they find typically attractive would differ from someone who grew up in a community of people who had lower BMIs.

Similarly, cross-cultural examinations have shown that south-eastern cultures such as African culture tend to find heavier women with higher BMIs more attractive and scientists declare this due to the culture/geographic location. In an environment that is majority in poverty, access to food is a luxury, thus carrying more fat is a signal of wealth which is attractive. The study by Tovee and colleagues (2006) consisted of Caucasian people from the UK, Africans from the UK, Zulus who moved to the UK in the last 18 months, and Zulus Africans. They asked how attractive they found 50 women's bodies and calculated BMI and WHR. What the results showed was that the UK Caucasians and Zulus from the UK found a middle preference for BMI. Zulus who migrated to the UK were in the middle of average and high BMI, and Zulus preferred high BMI who are ‘less' curvy. These results can support that one’s environment and culture have a great influence on what one perceives as attractive regarding body weight (Tovee et al., 2006). Another cross-cultural study by Crandall and colleagues (2001) found that amongst six nations, Australia, India, Poland, Turkey, the United States of America, and Venezuela, individualist cultures that had negative value for fatness and a tendency to hold people accountable for their own actions predicted anti-fat bias, which could reflect the differences in obesity stigma amongst individualistic and collectivist cultures by classifying obese individuals as “blameworthy” (Crandall et al., 2001). This study is good supportive evidence that obesity stigma deriving from misconceptions such as accountability for their own obesity is a cross-cultural view: one has control over their weight.

Another culture, or rather a community, that views obesity in a positive light is the Bear community. “Bears” are heavier, older, hairier men in the gay community (Edmonds & Zieff,

2015). Men in the Bear community have expressed feeling sexually attractive, and they feel in these communities that obesity stigma almost becomes diminished. If a 'bear' tries or starts to lose weight, he is seen as betraying his bear identity and even the community (Edmonds & Zieff, 2015). Smaller men who are not bears who date bears are considered 'chasers'; this is parallel to people outside of the Bear community who happen to date an obese individual when they themselves are not obese, and it may be seen as a "fetish." Although the Bear community is positive and accepting, most of the men in it have yet to come to terms with the stigma they face, and confidences' may have to do with the overwhelming obesity stigma that exists outside of the community and in their everyday lives.

Along with discussing the possible effects of exposure, geographic location, and culture on perceptions of obese individuals, discussing the misconceptions of obese individuals and recognition of these misconceptions may allow us to shift or reestablish our disgust reactions towards obese individuals.

The Role of the Environment on Obesity Stigma

The beauty of evolution is that it is constant because our environment is inevitably changing every second. Our environment changes, living organisms are pressured to change and adapt to the new environment, and those who have more "fit" qualities survive in the new environment, while those with unfit qualities most likely do not survive. Our modern-day environment includes access to foods, both healthy and unhealthy, unprocessed and processed, which is a feature that did not exist thousands of years ago. Unhealthy and processed foods present a new threat to our health, and in turn creates new pressures forcing us to adapt but survive this environment; those who cannot get "weeded" out naturally through the process of

evolution. The key to sculpting these domains may be the culture of the individual, where cues for disgust are based on their life experiences and environment. For example, in the United States where obesity is extremely stigmatized, perhaps obese individuals generally, as data suggests, set off disgust cues under the main 3 domains for people who were raised in America. Something special about America is the surplus in food; in fact, there is a global surplus in food today which was not the case dating back to ancestral times (Radford 2008). I suggest countries that have a surplus in accessible food such as the United States is a key contributor to obesity and obesity stigma. For example, some researchers have termed it "supply and demand"—with the majority of Americans being overweight (36.5 percent obese, 32.5 percent overweight, overall, two-thirds of the adult population) being thinner is more "in demand" or rarer, therefore more appealing (Holland 2022; Radford, 2008). Maybe there is a subconscious judgement of "self-control," a highly looked upon attribute that may fall under morality, or maybe its own domain, for people who are not obese in obese ridden environments. Researcher Pat Barclay proposes that people typically choose their social partners, which allows us to avoid bad partners and preferentially interact with better ones (Barclay, 2016). This creates a biological market where people prefer to associate with others who are willing and able to confer benefits upon partners; what can be provided and how much is provided is very much determined by the environment (Barclay, 2016). If something is scarce in an environment, providing that item would be deemed extremely generous, or in the claim of this paper, providing something "rare" such as good health and lower body weight in a predominantly obese environment would be generous or most sought after in a partner (life partner, friend, general association); it may also signal a trait such as good self control. However, let us say the item that was scarce is now very abundant and other individuals seem to provide it more than your partner; this would affect how one would calculate

their generosity. Similarly, perception of what is an "average" body type can be very subjective by not only a society or culture, but something as small as a town, city, or county. If most people in a county are–on average–larger individuals, people living in that county may view "average" body type as completely different from a person from a county with an overall lower average body weight. This is to say that even perceptions of what body types are underweight, average weight, overweight, and obese may not be universal to the average and common eye.

Another important point of understanding how processed foods such as fast foods affect us is the "backwards" affect it may have on our bodies. In our evolutionary timeline there may have been a period in which food was scarce and having a larger figure may have been highly looked upon as access to food and resources; this is not the case of today (Radford, 2008). Fast, unprocessed, and unhealthy foods are generally more accessible and cheaper than healthy, processed, and organic foods; a review of 27 studies in 10 countries found that unhealthy food is about $1.50 cheaper per day than healthy food (See, 2020). Fast, unprocessed, and unhealthy foods in large or small quantities by nature, lead to increased body fat and health risks (Poti et al., 2017). Therefore, there is a "backwards" effect in the cue of processing someone who is obese: today, increased body fat or obesity may signal or cue for access to small or large amounts of unhealthy and processed foods, and not access to a surplus of healthy organic foods that were more likely prevalent and accessible years ago. So, not only does the surplus of food in our environment contribute to the stigmatization of obese individuals and demand for thinner individuals, but obesity no longer signals only access to larger quantities of healthy and valuable foods, but processed, unhealthy foods which may be looked down upon on a moral, pathogenic, or sexual level, and further elicit disgust in these 3 domains. We may process visual cues of an underweight, average weight, overweight, and obese weight person through the subconscious

coding of our ancestors; but I suggest which one codes for being more "valued" or "appealing" to us most likely depends on our modern environment. I suppose if the world went through a global famish of food, years from now obesity stigma may be nonexistent due to the demand of overweight or obese people.

Some may ask about the point in our evolutionary timeline where agriculture developed, access to food increased, and transportation technologies began developing, which all probably led to the development of obesity. While there is no single point in an evolutionary timeline, there may have been a time when obesity was favored upon because it may have cued for access to food, health, access to resources, wealth, and more. But what happens when maybe half the population is in starvation and the other half has a food surplus? Well, who really knows? I may suggest that obesity may have been positively cued as sign of fitness at one "point", but perhaps also negatively cued with an association to *gluttony. The Seven Deadly Sins and the Four Last Things* is a painting attributed to Dutch painter Hieronymus Bosch, or to a follower of his, completed around 1500 or later (Struthers, 1996). In the painting, gluttony is depicted as one of the sins, confirming that ideas of gluttony may have been contributing to obesity stigma under the moral disgust domains for years.

Years ago, there were no nine to five desk jobs, high food portions, or cheap, unprocessed foods for our ancestors to experience, but these all exist now and do contribute to obesity. We adapt to these new features of our environments but may subconsciously process and falsely code the cues within it (i.e., cues of obesity) to ultimately lead to our moral, health, and sexual success.

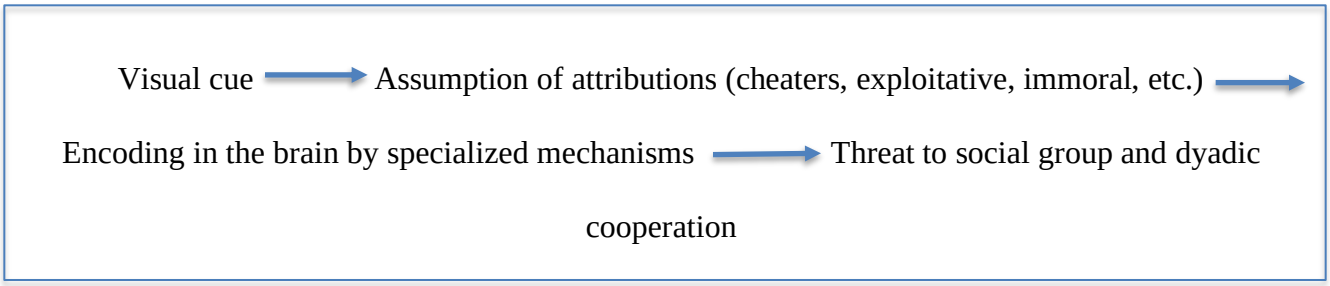
Obesity Stigma: A Multi-dimensional Model & Where to Go from Here

Understanding the evolutionary factors that may contribute or be partially responsible for obesity stigma is crucial towards diminishing the stigma. Not only do obese individuals experience stigmatization due to one domain, but as research suggests, multiple domains that may all be interconnected, ultimately intensifying the stigmatization. Observing children can be efficient in finding innate disgust reactions to obese individuals on a moral or pathogen level; however, it would be unethical to measure sexual disgust in relation to obesity stigma in children, leaving the only pool of participants to be adults. Due to this restriction, it is hard to support the evolutionary basis of sexual disgust in relation to obesity stigma unless there was a multitude of cross-cultural evidence already existent that supports this domain–but it is lacking. In fact, evidence may be contradictory such as the Zulus of Africa finding heavier women as more attractive. A possibility that could be further investigated in future research is that people may be born with innate capacity to feel disgust and be triggered by cues, but that our environments, culture, exposure, and more sculpts *what* is a cue. Future researchers can take many steps in investigating if these disgust cues under the 3 domains are innate by continuing cross-cultural research and considering the social perimeters on body image, and stigmatization on body types. Also, sexual disgust needs to be further investigated cross-culturally; specifically, future research should investigate why men seem to have greater sexual disgust towards obese individuals (generally obese women) and what evolutionary reason might be driving it. Surely, men should have some selection when choosing a healthy woman to have offspring with, but women should yield more selective due to pregnancy being costly. In addition to this, sexual disgust to obese individuals should also be explored across multiple sexualities.

There is little to no existing evidence that countries who may see higher weight as a signal of beauty such as the Zulus of Africa also have an innate disgust reaction triggered by

physical cues of underweight individuals. While there is little to no research investigating disgust reactions to underweight individuals, future directions could entail surveys or experiments investigating this, specifically in environments with a food scarcity. In addition to this, I would believe a next step in assessing how obese individuals are perceived should include assumptions about income, specifically low income. Although it has been reported that obesity is more prevalent in low-income areas, the *perception* people have is also important in supporting the idea that perception of low income may code for less resources, poorer diets, and possibly less desire for association with obese individuals, ultimately intensifying obesity.

Further, I suggest a way to hopefully intervene during the processing of disgust from a visual cue of obesity under the domain of moral disgust. The perception of obese individuals as having lower income, resources, and undesirable personality traits (cheaters, exploitative, and immoral) are categorized in under the domain of moral disgust in relation to obesity stigma. If we look closely at the process of coding a visual cue of an obese individual under the moral disgust domain, it may look something like this:



Unlike how pathogen and sexual disgust may be elicited *directly* from a visual cue of an obese individual, the encoding process for moral violation first includes assumptions and associations of obese individuals with (often) misconceptions and false attributions. I suggest further research should investigate whether intervening with the encoding process during the

association stage would help eliminate or at least help lessen or diminish the domain of moral disgust towards obese individuals; I further suggest a proper way to intervene may be through education, and empirical research can follow to investigate these effects.

Lastly, future research may want to investigate how the 3 domains of disgust are interrelated and affect each other; similarly, exploring how environment, culture, and exposure affects the 3 domains of disgust in relation to obesity stigma would be beneficial to eventually apply more methods of intervention to eliminate the stigma and the possible evolutionary contributions.

Conclusion: A General Discussion of Evolution and Obesity Stigma

Overall, our world is full of visual cues that our brain processes and codes for due to evolution and environmental pressures our ancestors face. In this review, I explored three specific domains of disgust regarding obesity stigma: (1) moral disgust/dyadic cooperation, (2) pathogen resistance, and (3) sexual disgust. After drawing from developmental, cross-cultural, and evolutionary research, the 3 domains of disgust and reactions that follow seem to have been passed down from ancestors and continue to exist as a way to detect bad dyadic cooperation partners and partners that would threaten the survival of a group (moral), as a way to detect and refrain from coming into contact with detrimental pathogens (pathogenic), and as a way to detect costly partners to offspring (sexual), all in relation to obesity stigma. I suggest we are born with an innate capacity to for a disgust response to moral violations, pathogens, and reproductive costs; yet our environments and cultures sculpt what is viewed as immoral, pathogenic, or costly in a particular context. Unfortunately, it seems as though many modern-day environments have sculpted a negative connotation around obesity, and I suggest this initial negative connotation may lead to an intensifying of cues. By becoming conscious of these possibly contributing

evolutionary factors to obesity stigma, in which we have little to no understanding or research on, the better chance we have at working towards recognizing, modifying, and maybe even ridding of disgust reactions, along with related thoughts and behaviors. The better we can educate and understand the origins of obesity stigma, the better chance we have at altering our perceptions and creating a more accepting and inclusive society.

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