UNIVERSITY OF CALIFORNIA, MERCED

VISUAL REPRESENTATION OF HIGHER-WEIGHT INDIVIDUALS IN PHYSICAL ACTIVITY HEALTH COMMUNICATIONS: A CONTENT ANALYSIS OF HIGHLY VISITED AND TRUSTED HEALTH INFORMATION WEBSITES

A Dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy

In

Psychological Sciences

by

Katie E. Alegria

Committee in charge:

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2022

The dissertation of Katie E. Alegria is approved, and it is acceptable in quality and form for publication on microfilm and electronically:

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ACKNOWLEDGEMENTS

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EDUCATION

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RESEARCH INTERESTS

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PUBLICATIONS

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Alegria, K., Fleszar-Pavlović, S., Hua, J., Ramirez Loyola, M., Reuschel, H., & Song, A. V. (2022). How Socioeconomic Status and Acculturation Relate to Dietary Behaviors Within Latino Populations. *American Journal of Health Promotion*. https://doi.org/10.1177/08901171211059806

Alegria, K. E., Fleszar-Pavlović, S. E., Ngo, D. D., Beam, A., Halliday, D. M., Hinojosa, B. M., ... & Song, A. V. (2021). The Role of Risk Perceptions and Affective Consequences in

COVID-19 Protective Behaviors. *International Journal of Behavioral Medicine*, 1-7. https://doi.org/10.1007/s12529-021-09970-4

Alegria, K. E., Schneider, S., Espinoza, S., Song, A.V, Gonzalez, M. (*Under Review*). Perceptions of the Prevalence of Substance Use in an Agricultural Region of California.

Fleszar-Pavlović, S. E., **Alegria, K. E.,** & Epperson, A. E. (*Under Review*). Beliefs about the benefits of cannabis use among an American Indian/Alaska Native population.

Fleszar-Pavlović, S. E., **Alegria, K. E.,** Hua, J., Durazo, A., & Song, A. V. (*Under Review*). Associations between milk consumption and body weight status within Mexican American and Non-Hispanic White populations.

Alegria K.E., Cameron L.D. (2020) Cognitive Mediators. In: Gellman M. (eds) Encyclopedia of Behavioral Medicine. Springer, New York, NY. http://doi.org.https.jxnydx.proxy.chaoxing.com/10.1007/978-1-4614-6439-6_1119-2

MANUSCRIPTS IN PREPARATION

Alegria, K. E., Cameron, L.D., Tiemensma, J. (*In Prep*). Dietary Intake, Body Image, and Quality of Life in Patients with Cushing's Syndrome.

Alegria, K. E., Cameron, L.D. (*In Prep*) Do Fruit and Vegetable Intake Relate to Perceived Stress and Psychological Distress: A Meta-Analysis.

Beam, A.B., Johnson, A., **Alegria, K.E.,** Fleszar-Pavlović, S. E., McAnally, K., Ngo, D. D., Song A.V., Howell J. (*In Prep*). COVID-19 Related Risk Behaviors Among People with or Exposed to those with Chronic Illness

RESEARCH PRESENTATIONS

Alegria, K. E., Espinoza, S., Gonzalez, M. (2022). Perceptions of the Prevalence of Substance Use in an Agricultural Region of California, Paper presentation at the 43rdth Annual Meeting and Scientific Sessions of the Society of Behavioral Medicine, Baltimore, MD.

Alegria, K. E., Cameron, LD. (2022) Do Fruit and Vegetable intake Relate to Perceived Stress and Psychological Distress: A Meta-Analysis, Paper presentation at the 43rd Annual Meeting and Scientific Sessions of the Society of Behavioral Medicine, Baltimore, MD.

Alegria, K. E., Fleszar-Pavlovic, S.E. (2021) The Role of Illness Risk Perceptions and Uncertainty in Health Behaviors During the COVID- 19 Pandemic, Oral presentation in the HSRI Covid-19 Research at UC Merced session of UC Merced Research Week 2021

Fleszar-Pavlovic, S. E., **Alegria, K. E.,** Johnson, A., Song, A.V., (2021) Uncertainty and Adverse Health Behaviors During the COVID-19 Pandemic, Research spotlight at the 42nd Annual Meeting and Scientific Sessions of the Society of Behavioral Medicine, Virtual Conference

Fleszar-Pavlovic, S. E., **Alegria, K. E.,** Hua, J. N., Song, A.V., (2020) Associations between Milk Consumption & BMI within Mexican American & Non-Hispanic White Populations, Accepted paper presentation at the 41st Annual Meeting and Scientific Sessions of the Society of Behavioral Medicine, San Francisco. *Posted in PDF format to SBM website due to COVID-19

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Alegria, K. E., Tiemensma, J., (2018). Dietary intake and body image in patients with Cushing's syndrome, First Year Presentation at the University of California, Merced.

Alegria, K. E., Wohldmann, E. L. (2017). Does technological nature make us smarter: Exploring the impacts of technological nature on cognition. Public Thesis defense, Northridge, CA.

Alegria, K. E., Wohldmann, E. L., (2017). Does technological nature make us smarter: Exploring the impacts of technological nature on cognition, Paper presentation at the 97th Annual Meeting of Western Psychological Association, Sacramento, CA.

Alegria, K. E., Wohldmann, E. L. (2017). Does technological nature make us smarter: Exploring the impacts of technological nature on cognition. Paper presentation at the CSUN Student Research and Creative Works Symposium, Northridge, CA.

Wohldmann, E.L., **Alegria, K. E.** (2016). Does seeding promote long term retention of calorie information: Testing the generation effect. Paper presented at the 57th Annual Meeting of the Psychonomic Society, Boston, MA.

Alegria, K. E., Wohldmann, E. L. (2016). Does seeding promote long term retention of calorie information: Testing the generation effect. Paper presentation at the 96th Annual Meeting of Western Psychological Association, Long Beach, CA.

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Fleszar-Pavlović, S. E., **Alegria, K. E.,** & Epperson, A. E. (2022). Beliefs about the benefits of cannabis use among an American Indian/Alaska Native population, Poster presentation at the 43rd Annual Meeting and Scientific Sessions of the Society of Behavioral Medicine, Baltimore MD

Beam, A.B., Johnson, A., **Alegria, K.E.,** Fleszar-Pavlović, S. E., McAnally, K., Ngo, D. D., Song A.V., Howell J. (2022). COVID-19 Related Risk Behaviors Among People with or Exposed to those with Chronic Illness, Poster presentation at the 43rd Annual Meeting and Scientific Sessions of the Society of Behavioral Medicine, Baltimore MD

Alegria, K. E., Tiemensma, J., (2019). Dietary intake, body image, and quality of life in patients with Cushing's syndrome, Poster presentation at the 40th Annual Meeting and Scientific Sessions of the Society of Behavioral Medicine, Washington D.C

Alegria, K. E., Sinha, Mrinal (2014). College Students' Attitudes toward Feminism. Poster presentation at the Annual Senior Capstone Festival, Monterey, CA.

TEACHING EXPERIENCE

Psychological Sciences Department, University of California, Merced

	Graduate Teaching Fellow
Spring 2022	Psy 120: Health Psychology
Fall 2021	Psy 143: Abnormal Child Psychology
	Instructor of Record
Summer 2021	Psy 001: Introduction to Psychology
	Graduate Teaching Assistant
Spring 2021	Psy 001: Introduction to Psychology
Fall 2020	Psy 190: Theories of Behavior Change
Spring 2020	Psy 001: Introduction to Psychology

Fall 2019	Psy 010: Analysis of Psychological Data
	Psy 010 35L
	Psy 010 36L
Spring 2019	Psy 159: Personality Psychology
Fall 2018	Psy 001: Introduction to Psychology
Spring 2018	Psy 001: Introduction to Psychology
Fall 2017	Psy 158: Positive Psychology

Psychology Department, California State University, Northridge

Instructor of Record

Spring 2017	Psy 320L: Statistical Methods in Psychological Research
Fall 2016	Psy 320L: Statistical Methods in Psychological Research
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RESEARCH EXPERIENCE

Spring 2019- **Graduate Student Member**

Health Communications and Interventions Lab
PI: Dr. Linda Cameron, University of California, Merced
Visual representation of higher-weight individuals in physical activity health communications: A content analysis of public health websites
Does fruit and vegetable intake relate to perceived stress and psychological distress? A systematic review and meta-analysis
Dietary intake, body image, and quality of life in patients with Cushing's syndrome

Summer 2021- **Graduate Student Researcher**

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Beliefs about the benefits of cannabis use among an American Indian/Alaska Native population
Perceptions of the Prevalence of Substance Use in an Agricultural Region of California

Fall 2017-Fall 2018 **Graduate Student Member**

PsychoNeuroEndocrinology Lab
PI: Dr. Jitske Tiemensma, University of California, Merced
Dietary intake, body image, and quality of life in patients with Cushing's syndrome

2015-2017 **Graduate Student Member**

Learning and Memory Research Lab
PI: Dr. Erica Wohldmann, California State University, Northridge
Does seeding promote long term retention of calorie information: Testing the generation effect
Does technological nature make us smarter: Exploring the impacts of technological nature on cognition

2013-2014 **Undergraduate Research Capstone**

PI: Dr. Mrinal Sinha, California State University, Monterey Bay

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AWARDS, HONORS, AND SCHOLARSHIPS

University of California, Merced

2022 Graduate Student Development Funding
2021 Psychological Sciences Research Dissemination Award
2021 William R. Shadish Award for Leadership and Service
2021 Graduate Student Development Funding
2021 Certificate in Quantitative Methods
2020 Psychological Sciences Research Dissemination Award
2020 William R. Shadish Award for Leadership and Service
2019 Health Psychology Presentation Travel Funding
2019 Meritorious Abstract Award at Society of Behavioral Medicine's 40th Annual Meeting, "How Socioeconomic Status and Acculturation Related to Dietary behaviors Within Latino Populations"
2019 Health Sciences Research Institute Graduate Student Writer's Fellowship
2018 Psychological Sciences Summer Support Funding
2018 SSHA Dean's Summer Research Funding

California State University, Northridge

2017-2018 Chancellor's Doctoral Incentive Program Scholar
2017 2ND Place oral presentation at CSUNposium (Creative Works Symposium)
2016-2017 Thesis Support Funding
2016-2017 Graduate Equity Program Fellow
2016-2017 Accepted into the Statistics Teaching Internship Program
2016 Accepted into the Teaching Research Program

California State University, Monterey Bay

2012-2014 Dean's List (multiple Semesters)
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Fall 2013 Invited to join CSUMB Psi Chi chapter

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2022-Present Deputy Awards Chair for SBM Climate Change and Health SIG
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2020-Present Society of Behavioral Medicine (SBM), Presidential Working Group on Climate Change and Health, Member, Climate Change-related Health Disparities Subgroup
2021 Committee Member, Graduate Student Mental Health and Well-Being
2021 Panelist, 2021 University of California, Merced Research Week
2020-2021 Peer Mentor, University of California, Merced Grad-EXCEL Program
2021 Committee Member, Graduate Student Orientation Week
2019 Program Committee Member, University of California Intercampus Consortium on Health Psychology
2019 Invited Event Panelist, APA Division 38
2018-2019 Committee Member, University of California, Merced Psychological Sciences

Prospective Graduate Student Weekend
2017 Invited Panelist, CSUN GRE Student-Expert
2017 Panelist, CSUN Introduction to Graduate School

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Skill Accelerator Workshop: Publishing Manuscripts
March 11th, 2022, 11:00 am to 3:00pm at University of California, Merced
Workshop Attendee, Presented by Kyra Hamilton, PhD & Martin Hagger, Ph.D.
Skill Accelerator Workshop: Open Science
October 29th, 2021, 11:00 am to 3:00pm at University of California, Merced
Workshop Attendee, Presented by Martin Hagger, Ph.D.
Bayesian Bootcamp: Fundamentals, Extensions, and Guidelines for Best Practice
April 30, 2021, 9:00 am to 4:00 pm at University of California, Merced
Workshop Attendee, Presented by Sarah Depaoli, Ph.D. & Haiyan Liu, Ph.D.
Teaching Matters Workshop Series
(Backward) Lesson and Curriculum Design ‡
March 12th, 2018, at the University of California, Merced
Workshop Attendee, Creating a learner-centered lesion and curriculum.
Designing Rubrics ‡
March 12th, 2018, at the University of California, Merced
Workshop Attendee, Creating an effective rubric.
How to Write a Teaching Statement ‡
October 19th, 2018, at the University of California, Merced
Workshop Attendee, Creating a teaching statement.
Instructional Assessment and Student Evaluations ‡
October 19th, 2018, at the University of California, Merced
Workshop Attendee, Evaluating teaching effectiveness.
‡: Part of the Center for Engaged Teaching and Learning
Lab Safety Courses
Fire Safety in the Lab, Fall 2018
Lab Safety Fundamentals w/o HazMat: Environmental Health & Safety
Personal Protective Equipment Hazard Assessment Certification

AD-HOC REVIEWER

International Journal of Behavioral Medicine
Several manuscripts reviewed

PROFESSIONAL MEMBERSHIPS

Society of Behavioral Medicine
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R Statistical Software
Mplus Statistical Software
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ABSTRACT

Dissertation Title: Visual Representation of Higher-Weight Individuals in Physical Activity Health Communications: A content analysis of highly visited and trusted health information websites
Name: Katie E. Alegria
Degree Name: PhD Psychological Sciences
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Committee Chair: Linda D. Cameron, PhD

Objective: Physical activity is recommended to improve a variety of health outcomes. Individuals living in higher-weight bodies are an important target for effective physical activity health communication, yet this population is historically underrepresented in the media and experiences high levels of weight discrimination in the medical and health communities. Imagery is an effective communication strategy that may be particularly impactful because it can elicit especially powerful affective responses and influences on health behavior. The current state of imagery used in physical activity health communications is unknown; thus, the aim of this study is to conduct a content analysis of images depicting people of varying body weights used in online physical activity health communications.

Methods: A content analysis was conducted on the five most trafficked websites in 2021 for physical activity information and five highly trusted government websites for health information. Illness representation domains delineated by the common-sense model of health and illness behavior informed which characteristics of the images were coded, including: weight status of the individual, type of physical activity, the rigor and exertion of this activity, affect, clothing, receiving social support, context of weight loss, full versus partial depictions of the body, gender, skin color, and age. One researcher coded all images while a second coded 20% of the sample for interrater reliability.

Results: Results indicate that proportions of individuals in higher-weight bodies were significantly lower than expected based upon the US population statistics on bodyweight status. Several stereotypical characteristics of weight representations were present (e.g., higher bodyweight status was associated with more modest clothing), however counter-stereotype patterns were found as well (e.g., rigor of physical activity was not lesser for those of higher bodyweight status).

Conclusions: Higher-weight bodies are underrepresented, less likely to be portrayed with social support, more likely to be portrayed in the context of weight loss, and dressed more modestly in physical activity health communications. However, rigor of activity level, and distress and exertion while being active did not differ across bodyweight status. Further reducing stigmatizing images in physical activity health communications may reduce stereotyping and discrimination and allow for more effective health messaging.

CHAPTER 1: INTRODUCTION OF PHYSICAL ACTIVITY HEALTH COMMUNICATIONS AND WEIGHT STIGMA

Physical activity is among primary recommendations for weight management, cardiovascular health, type 2 diabetes prevention and prevention of other illness and risk factors associated with current leading causes of death (CDC, 2016). Regular physical activity is also recommended for individuals living in higher-weight bodies or who qualify to be categorized as overweight or obese (CDC, 2016). Although physical activity is a beneficial health behavior for many mental and physical health outcomes that are unrelated to weight, it is often recommended to people living in higher-weight bodies specifically for the purpose of weight loss. These types of weight loss-focused communications can promote negative feelings toward and alienate individuals living in higher-weight bodies (e.g., Puhl, Luedicke & Heuer, 2013.). Additionally, spaces in the U.S. that promote physical activity (e.g., gyms, tracks, and hiking or biking trails) and physical activity professionals (e.g., trainers and gym employees) historically promote Western cultural ideals that contribute to weight stigma and discrimination, making them less inclusive or safe spaces for higher-weight people (Puhl & Brownell, 2013., Zuest et al., 2022). Not only do individuals living in higher-weight bodies report feeling embarrassed and self-conscious in physical activity contexts (e.g., McIntosh, Hunter, & Royce, 2016), but perceived weight stigma and discrimination reduce engagement in physical activity (Himmelstein et al., 2018; Vartanian & Shaprow, 2008). Health messages and physical activity spaces that are not welcoming to higher-weight individuals can exacerbate negative stereotypes, such as beliefs that individuals living in higher-weight bodies do not participate in physical activity, are lazy, and lack determination or self-control (Puhl et al., 2008; Pearl, 2018).

These stereotypes and experiences are examples of weight stigma, a phenomenon that can lead to discrimination towards and promote negative physical and psychological health outcomes for people across a variety of body weight statuses, but particularly so for those of higher weight (e.g., Vartanian et al., 2018; Tomiyama, 2014). Current literature discusses how people, especially women, living in higher-weight bodies are vastly underrepresented in television, films, and advertisements (Ata & Thompson, 2010; Shinoda et al., 2021). When they are represented, they are often assigned negative, stereotypical characteristics. Imagery or visual representations of higher-weight individuals in news media have notoriously been dehumanizing and stigmatizing, often showing higher-weight bodies with no heads, eating at fast food restaurants, or exhibiting sedentary behaviors (Greenburg et al., 2003; Selensky & Cerels, 2021). Research demonstrates that viewing images that promote these types of stereotypes increases anti-fat bias attitudes, perceptions of laziness, and social distancing from people living in higher-weight bodies (e.g., Frederick et al., 2016; Mclure et al., 2011). In contrast, including images of higher-weight bodies in positively framed communications can promote positive attitudes and reduce negative stereotypes (e.g., Puhl et al, 2013). Additionally, participants who qualify for overweight or obese classifications respond more favorably to health campaigns that focus on positive behavior change and increasing self-efficacy, whereas they respond negatively to campaigns featuring weight-loss messages or stigmatizing words and images (Thomas

et al., 2010).

Imagery as a health communication tool can have robust influences on both cognitive and affective responses to health information (Hammond et al., 2004, McCaul et al., 2007). Imagery has been used in a variety of health and risk communications to increase or decrease behaviors, as well as influence attitudes surrounding differing health conditions and appraisals of health communications (Cameron & Chan, 2008). Cameron and Chan (2008) discuss how imagery that matches the desired effect of certain health communication is vital; for example, if a health communication aims to elicit feelings of efficacy about a certain behavior, the accompanying imagery should depict positive engagement in and positive affective responses to the behavior. Imagery can be a powerful tool in efforts to promote healthful information or behaviors, particularly physical activity (Chan & Cameron, 2012; Lee et al., 2011) It may be beneficial in eliciting both cognitive and affective responses to physical activity information for individuals at risk for health conditions for which physical activity is prescribed. Further, a lack of visual representation or an abundance of stigmatizing imagery of higher-weight bodies in health communications about physical activity could have detrimental impacts on viewers regardless of body weight status by promoting stigmatizing beliefs and discriminative behavior. The current study aims to investigate how higher-weight people are visually represented in health communications surrounding physical activity. While there are innumerable communications about physical activity information that could be considered, we focus specifically on websites that include intentional health communication. Below, we will discuss the prevalence and effects of weight discrimination and stigma and how they might relate to physical activity health communications.

Weight Stigma

Weight stigma is a broad term that describes instances in which people who are perceived to be overweight are exposed to negative stereotyping, prejudice, and discrimination and, more generally, are devalued and marginalized by society (Tomiyama et al., 2018). Weight discrimination is the unequal treatment of people because of their weight and examples include being denied a promotion or fired from a job, receiving inferior medical care, facing environmental discrimination (e.g., lack of accessibility in the workplace), and being denied a bank loan due to being perceived as overweight. People who are perceived as overweight are underrepresented in media, academia, and in many other careers (e.g., Fikkan et al., 2012). Some of the stereotypes surrounding overweight individuals are that they are lazy, lacking in self-control, unmotivated, selfish, unkempt, of lesser intelligence or slow thinking, and unattractive (Puhl et al., 2008; Shwartz, et al., 2003; Tomiyama, 2014). It is pervasive across multiple domains of daily life, and notably, in healthcare settings (Alberga et al., 2019; Tomiyama et al., 2018). In their reviews of weight stigma, Puhl and Heuer (2001, 2012) brought scientific attention to both the pervasiveness and impacts of weight stigma. Their 2012 updated review details how weight stigma had become even more prevalent, having impacts such as “severely obese” white women earning 24% and “severely obese” Black women earning 14.6 % less than their “normal-weight” counterparts in certain careers. They also cite a study conducted by Bertakis and Azari (2005) in which they observed 105 physicians and their visits with 506 new patients and found that

physicians spent less time on health education with obese patients than with more normal-weight patients. Puhl and Heuer (2012) also discuss the absence of representation of "obese individuals" in television and media, and how when they are present it is often in an exploitative manner. Meaning, that these individuals are portrayed with over exaggerated stereotypical behavior (eating copious, unrealistic amounts of food, being extremely unkempt) combined with humor relating to these individuals' bodyweight status. Examples include the "obvious" entertainment and hilarity of obese persons dating, trying -and failing- physical feats, and mishaps related to bodily function. The authors call for further research in domains where chances for weight-based stereotyping or discrimination are high such as plane travel and public health clubs (Puhl & Huer, 2012).

While weight discrimination and stereotyping are related constructs that are often coupled underneath the broader umbrella of weight stigma, they are also distinct and can have differential impacts (Obesity Action Coalition, 2022). Whereas weight discrimination, i.e., the unequal or unfair treatment of those based upon weight, can be tangible in many cases as seen in policies, hiring rates, making spaces not accessible, etc., weight-based stereotyping can be less observable or apparent and they can even be implicit, or not conscious to the holder of such attitudes, expectations, and beliefs (Pearl, 2018). In a review on weight bias and stigma, Pearl (2018) argues that weight discrimination is weight stereotyping manifested into actions and discrimination. These differences can be seen in the impact they can have on the group being targeted for marginalization. For example, reducing the earning potential for a group of people can also deny them of factors that are protective for illness and disease onset (e.g., Gravlee, 2020). This form of discrimination might occur without the affected people being aware that it is occurring. On the other hand, experiencing stereotyping can lead to internalized weight bias that reduces self-esteem, self-efficacy, and a desire to engage in comforting, not necessarily healthy, behaviors (Tomiyama, 2014). Some characteristics attributed to those in higher-weight bodies include that these individuals do not have self-control or motivation (Tomiyama, 2014). There are also beliefs that those in larger bodies do not engage in physical activity or eat healthy foods (Puhl & Heuer, 2012).

Weight discrimination is highly prevalent in the U.S. as well as in many other countries (e.g., Pearl, 2018). For example, a survey of a nationally representative sample of adults in the U.S. found weight discrimination to be more prevalent than discrimination due to sexual orientation or physical disability for both men and women and, while equivalent to racial discrimination for men, it surpasses prevalence of racial discrimination for women (Puhl, Andreyeva, & Brownell, 2008). These findings are in line with other evidence demonstrating high prevalence of weight discrimination (Brochu & Esses 2011; Puhl & Heuer, 2009; Tomiyama, 2014). Despite these trends, weight discrimination has received relatively little attention in health research when compared to other forms of discrimination, and research that investigates the relationship between weight discrimination and health outcomes is still emerging. With the aim of discussing weight prejudice, stigma, and discrimination without perpetuating it, the authors have chosen to use "individuals of higher-weight" to refer to the intended population. This term acknowledges higher-weight body status without assigning or implying pejorative or fatphobic content. Any other terminology utilized throughout this

paper is intentional based upon the population discussed in previous literature or specific groups (i.e. individuals living with obesity).

In past strategies, it was believed that weight shaming, denormalization of being at a higher weight, and weight-loss-focused messaging would be effective in inspiring weight-loss behaviors (e.g., Callahan, 2013). Not only have public health efforts explored the possibility of fat-shaming, ostracizing or denormalization as a strategy for managing weight, but prominent figures in talk-radio and television hosts call for "fat-shaming" as recently as 2022 (e.g. Bill Maher, Howard Stern, and Joe Rogan). Shame more broadly is well established to be a demotivator, meaning that experiencing shame leads to social isolating oneself and avoiding circumstance of future feelings of shame (e.g., Dolezal & Lyons, 2017;Wilkens & Foote, 2019). This avoidance in regards to health-related shame can be seen in relation to health contexts such as avoiding screenings with physicians, witholding information to health professionals, and reduced willingness to be in physical activity arenas (Dolezal & Lyons, 2017;Farell, 2011). Shame is considered to be a particularly powerful affective response, because it is entangled with one's identity and social status that has negative physiological and psychological outcomes (Dickerson et al., 2004). Some research has found that experiencing weight-related shame can increase desire to lose weight, while simultaneously decreasing personal behaviors associated with positive health outcomes or weight loss (Major et al., 2014).

The current literature that does exist on weight shaming discusses one of its more ironic outcomes, which is that it is associated with greater weight gain and increased body mass index (BMI) in men and women, across various countries and cultures. For example, experiencing weight discrimination increases eating and decreases self-efficacy surrounding the ability to control diet and exercise (Major et al., 2014). An investigation conducted on data from the Longitudinal Health and Retirement Study found that participants who experienced weight discrimination were approximately 2.5 times more likely to become classified as obese by the later time points and participants who were classified as obese at the baseline measure and reported experiencing weight discrimination were three times more likely to remain as such relative to those who had not experienced weight discrimination (Sutin & Terracciano, 2013). This was true even when controlling for demographic factors and baseline BMI. There is an abundance of research demonstrating that experiencing weight shaming, weight stigma, social threat or stereotype threat related to weight, are all related to maladaptive eating behaviors as well as other maladaptive behaviors, and they decrease willingness to be physically active (for reviews see Puhl & Brownell, 2013; Vartanian et al., 2018). Major and colleagues (2020) theorize that experiencing weight stigma increases the desires or motivations to engage in weight-reducing behaviors, but it is the reduction in perceptions of control and methods of coping with the threat of being stigmatized that promote negative health behaviors and weight gain.

While much of the existing literature focuses on how weight discrimination can lead or be related to maladaptive coping mechanisms, another relationship in an emerging sub-area of literature surrounding weight-specific discrimination investigates the physiological impacts rather than just behavioral consequences. For example, one study found that hair cortisol, an indication of long-term biological stress, was 33%

higher for those who had experienced weight discrimination across all classes of BMI relative to those who did not; the researchers discuss these findings within the context of how chronic exposure to elevated levels of cortisol might contribute to diet and weight-related health conditions (Lowe & Timko, 2004).

When considering both the prevalence of and positive relationship between perceived weight discrimination and weight, it becomes clear that this literature should inform health messaging and communication. Researchers discuss how experiencing weight stigma, weight discrimination, or perceptions that others might view them as overweight can lead to weight-based social identity threat (Major et al., 2014). Experiencing social identity threat motivates individuals to avoid domains in which they feel they will be devalued or face weight-based stereotyping, which often includes places for physical activity (Major et al., 2014). Additionally, health messages focused on weight loss or that highlight individuals who are not perceived as overweight tend to be perceived as anti-fat and individuals living in higher-weight bodies are less likely to adhere to the message's guidelines or information (e.g., Puhl et al., 2013; Thomas et al., 2010). Physical activity environments and communications that are exclusionary of people in higher-weight bodies not only reflect forms of weight discrimination, but they also play a role in further perpetuating these stereotypes. Health communication that includes images or discussions for those in higher-weight bodies but only in the context of weight loss, more lightweight or leisurely activities, exhibiting more negative affect, with increased social support, etc. are engaging in discrimination through exclusivity, but they could also promote stereotypical beliefs. These beliefs include ideas that people in higher-weight bodies are less likely to be physically active, require more social support due to lack of self-control and self-motivation, should be working out or being active specifically for the goal of weight loss, should "hide" their body or dress more modestly, and do not deserve the same level of respect that other normal-weight individuals do (i.e. dehumanization as depicted by bodies without heads or faces).

Images that are stigmatizing can alienate those who are living in higher-weight bodies, cause individuals to be less amenable to health messaging, promotes anti-fat behaviors, and fosters avoidance of these individuals by others. Weight stigma and discrimination can be perceived by individuals even in non-objectively higher-weight bodies when they perceive themselves to be overweight or have fears of being perceived as overweight (e.g., Puhl et al., 2013; Thomas et al., 2010), thus demonstrating how weight stigma can negatively impact individuals across all bodyweight statuses even if the current study highlights those in higher-weight bodies. Health communication is an essential tool that serves many purposes, including acting as an intervention to increase positive health behaviors and outcomes. Physical activity increases positive health outcomes spanning psychological, social, and physical health domains, making it vital to create health messages that are effective and not stigmatizing to higher-weight individuals.

CHAPTER 2: HEALTH BEHAVIOR CHANGE THEORIES AND HEALTH COMMUNICATION STRATEGIES

The Common-Sense Model of Self-Regulation

One potential approach to understanding how health communications can influence beliefs about individuals in higher-weight bodies is by utilizing the Common-Sense Model of Self-Regulation (CSM) to guide analyses of communications. The CSM delineates how representational domains of identity (labels and symptoms), cause (reason for onset), timeline(duration and time/age of onset), consequences (outcomes of the condition), control(preventability and or treatment), coherence (knowledge and understanding about the condition as "making sense"), and emotional representation (affective associations with the condition) can influence affective and cognitive responses to health threat and health stimuli which, in turn, guide health-related actions (Leventhal, Leventhal, & Cameron, 2001; See Figure 1). These representations of health status can inform beliefs, motivations, and behaviors, and influence emotional responses related to health stimuli (e.g., health communication). When individuals view health information, they process the information by perceiving and encoding contents relevant to these representational domains; these representations guide judgments, affective responses, and behavioral motivations and decisions. These behavioral motivations and decisions can shape health-promoting behaviors (e.g., reading an article about the dangers of skin cancer and deciding to apply sunscreen more regularly) as well as negative health behaviors (e.g., over-restricting calories when presented with information about the relationship between weight and cancer or using alcohol to cope with negative feelings when learning about increased risk of cancer). Several health conditions particularly relevant to physical activity communications and individuals living in higher-weight bodies include diabetes, stress, cardiovascular disease, cancers, agility, and mobility (Gallagher & LeRoith, 2015). Representations of these conditions and representations of weight status are inter-related and can share representational contents and beliefs. In this study, we focus specifically on weight status representations while acknowledging their inter-relatedness with multiple health conditions.

Cameron and Chan (2008) discuss how applying the CSM as a framework can increase effectiveness in utilizing imagery in health communication. The authors recommend that images that are cues to action (which would be especially appropriate in physical activity imagery) and images that convey self-efficacy and response efficacy could be particularly beneficial in enhancing the persuasiveness of the message and motivating adaptive behaviors. These images can foster representational coherence, or synergy of beliefs about the representational attributes, and promote direct connections between the health threat (in this case, the various health outcomes related to physical activity) and the treatment or recommended action (physical activity). Evidence also strongly supports positive imagery when it comes to action cues and motivation, and can be more appropriate when wanting to inspire behavior change (Cameron, 2008). In addition, communications that highlight the incremental process of behavior change and focus on more stable and quickly achieved goals can be effective in promoting and maintaining behavior change (Breland et al., 2012). In terms of increasing physical activity, setting tangible, incremental goals such as adding increments in duration or

distance to one's weekly run, incrementally increasing weight for weight training sessions, or monitoring improvements in breathlessness during workouts, would all be examples of the type of goals that improve motivation, self-efficacy, and attainment of fitness goals (Breland et al., 2012). Supplementing text messages about incremental goals with images can enhance their persuasiveness and impact on representations and physical activity adherence.

Breland and colleagues (2012) note that the CSM delineates a need for common-sense "matching" between treatment and cause of illness. This argument suggests that highlighting the relationship between weight gain and lack of physical activity and then offering tips to increase physical activity can improve coherence which, in turn, can motivate adherence (e.g., Lee et al., 2011). While this recommendation may be valid in many health circumstances (e.g., linking physical activity with prevention of heart disease), it has been established that health messaging that highlights personal behavior choices (such as the cause of weight gain) can be alienating to those in higher-weight bodies. For these individuals, messages that present physical activity as leading to other outcomes such as increased strength, reduced stress, and better sleep quality can potentially be a more effective approach for motivating physical activity.

Brun and colleagues (2014) discuss how the dual processing systems of the CSM complements previous work on how the media can influence public responses to health information. The authors cite research demonstrating that the release of media articles about specific health conditions is correlated with increases in individuals seeking treatment or screening for those conditions (e.g., Martin, 2003). Brun and colleagues employed the CSM to conduct a thematic analysis of Irish newspaper, radio, and other media formats on the discourse of obesity. They utilized the representational domains of the CSM for the condition of obesity to analyze text about obesity. Their results revealed high levels of pejorative, stereotyping, and discriminatory language surrounding obesity and individuals who can be categorized as such. This work analyzed text specifically referring to obesity, which differs from but nevertheless complements the current study aims of analyzing images in physical activity communications from a CSM representational perspective. Further, this prior work demonstrates the utility in applying a CSM representational approach to analyzing health messages from the perspective of weight representations.

CSM Representational Domains and Weight Representations

The representational domains identified by the CSM can help classify and understand weight representations conveyed by imagery used in physical activity communications. Individuals regardless of their body weight status have mental representations of their weight. Images of people used in physical activity communications contain features that can shape specific attributes of weight representations and assign beliefs about being a higher-weight individual (Table 1). For example, identity (symptoms and labels) includes perceiving an individual in an image as at a high weight (i.e., visually identifying someone as a higher-weight individual) versus as at a lower weight and characteristics that would accompany identifying someone as of higher weight. Identifying characteristics can include modest clothing and not featuring the entire body in an image. The terminology used in the context of the image can also shape identity (i.e., terms such as overweight, obese, fat, people who need to lose weight,

etc.). These types of features can influence beliefs about the prevalence of different body weights both in the general population and within physical activity arenas. The timeline attributes (duration or age of onset) are applicable in several ways, and we focus specifically on two aspects of timeline beliefs. First, the age of individuals who are depicted as higher-weight in health communications can inform beliefs about the typical onset of being higher-weight during the life span. For example, images depicting older individuals who are higher weight, suggest that onset happens at older ages. Second, images can influence beliefs about the duration of being at a higher weight. Types of images that could foster stereotypical beliefs about weight status include those depicting higher-weight bodies as temporary, such as by being shown as "before" images or in circumstances where weight status will change, compared to thinner bodies being depicted as remaining static or showing changes of aspects of the body (e.g., muscle gain) as independent of weight status. Beliefs about consequences (outcomes of the condition) may be informed by the level of exertion that those in higher weight bodies must exhibit to be physically active.

Emotional representations specific to weight may be shaped by images that present variations in emotional states across images of people with different types of weight. For example, if individuals in larger bodies are shown to be in distress while being physically active while those in thin bodies are depicted as happy or energized by the activity, these images could foster beliefs that individuals in higher-weight bodies do not enjoy physical activity and experience more distress in contexts of physical activity than individuals living in thin or "normal-weight" bodies. Control beliefs (i.e., whether the condition is preventable or treatable) are relevant when examining the contexts of the images, for example if both the image and context of the image is suggesting that being in a higher-weight body is related to physical activity or can be changed through physical activity, it asserts that weight is a controllable state. Images that promote messaging that discuss individual responsibility surrounding weight would fall under the control domain of weight representations. Cause and coherence, both important features of representations are not assessed in the current study because of the nuance required to identify what would inform these domains as opposed to others. For example, images in the context that sedentary behavior is the reason for being of higher-body weight status would inform the "cause" domain, however this would require more specific text analysis rather than focusing on imagery. This is also the case for coherence, where synergy between knowledge and communication were outside the scope of our analysis. However, the authors acknowledge that several of the characteristics and examples given for the other domains may also inform cause and coherence and there is overlap of which weight representation domains the specified characteristics may influence.

Imagery

Visual imagery has been utilized as a health communication tool across a variety of health behavior domains and represents a unique form of health communication that is distinct from text-based techniques (e.g., Lee et al., 2011). Images are processed differently than text; for example, text engages abstract, linguistic cognitive processes whereas images are processed within the concrete-experiential system. This latter type of processing includes relating the image to one's own memories and evokes understanding of cause and effect (Epstein, 1994). Understanding through one's personal experiences

and memories allows for the images to be accepted as probable and credible. This perceived credibility can enhance persuasion and inspire viewers to participate or abstain from certain health behaviors or accept health information that differs from prior beliefs. Because the concrete-experiential system is strongly linked with emotions and affective processes, it is particularly adept at eliciting powerful responses to information conveyed by an image prompting action (Cameron & Chan 2008). Further, imagery is recalled more quickly and readily than texts, making it useful for long-term impact on health behavior. Daily health-related decisions are often made quickly and can be done subconsciously or automatically (Jacquier et al., 2012). The relatively easier access to health information communicated through images may prove particularly impactful in shaping these types of decisions (Rolls, 2005). Further, images are processed faster than text and attract attention more easily, making them more readily available sources of health information or context than written words or text. For these reasons, imagery as a health communication strategy has been applied notably to smoking cessation efforts and explanations of disease progression (Evans et al., 2015, Lee et al., 2011; Magnan et al., 2021).

While images of diseased lungs on cigarette packs and other prominent examples of imagery as effective health communication rely upon fear arousal to promote healthy behaviors, there are some examples of positive framing working well through image communication as well. For example, images that show examples of ways that viewers can help manage the health effects of climate change elicits positive responses (potentially by enhancing control and self-efficacy beliefs) and increases motivation to take action to mitigate climate change (Peters et al., 2022). In relation to physical activity communications, which generally aim to promote an action such as increased frequency or length of being active within a certain timeframe, images that promote positive affective responses and strengthen control beliefs could enhance the efficacy of the communications.

The CSM delineates and places a strong emphasis on the roles of imagery in encouraging behavior change. It is important to note, however, that other theories used to guide health communications and interventions also inform the utility of specific types of images. Several behavior change theories include pathways and constructs that focus on the utility of portraying the typical person who performs the behavior (e.g., Prototype Willingness Model; Gibbons et al., 2008; The Theory of Planned Action; Triberti & Riva, 2016; Transportation-Imagery Model of Narrative Persuasion; Green & Brock, 2002). These theories detail how identifying and relating to a person portrayed in a communication and seeing oneself as belonging to the same group as that person can increase the likelihood that the message recipient will perform a behavior. With respect to weight status and physical activity, seeing a person of higher weight partake in an activity that can be shrouded in fear of stigma, may be empowering. However, it must be noted that these theories also discuss how valuing the typical person engaging in the behavior is a relevant factor, which may become complicated in a behavior like physical activity and a higher-weight participant because internalized weight bias or a desire to no longer be higher-weight may make a viewer less likely to respond positively.

Content Analyses and Individuals in Higher-weight Bodies

Existing content analyses of health communications surrounding individuals in

higher-weight bodies include analyses of social media and magazine communications. Previous studies on text in print-newspaper and print-magazine articles have found that personal, behavioral factors such as overeating and lack of physical activity are highlighted in communications surrounding obesity or higher-weight bodies rather than also discussing social economic or environmental causes (Campo & Mastin, 2007, Kim & Willis, 2007). Studies of television and other sources of entertainment media have revealed that individuals in higher-weight bodies tend to be presented as having negative characteristics while those in thin bodies are presented as having a greater variety of characteristics. Additionally, weight-related negative characteristics tend to be accompanied by laughter, social bonding, and humor amongst normal or thin bodied characters and persons (e.g., Himes & Thompson, 2007). Chou, Prestin, & Kunath (2014) found that text streams, posts, and comments about higher-weight individuals tended to be aggressive and alienating and to feature expressions of disgust and other negative reactions. Newspaper outlets, televised news, and news content found on social media often contain stigmatizing images and text about individuals in higher-weight bodies, especially in relation to health behavior. For example, Yoo and Kim (2012) conducted a content analysis of YouTube videos, a popular media form where individuals seek out health, social, and political information as well as entertainment. The authors found that persons perceived to be categorized as having obesity were the subject of negative weight-related humor in 20% of the videos and were shown engaging in unhealthy eating behaviors and sedentary behaviors in a vast majority of the videos coded. The authors discuss how these videos may have robust impacts on the viewers because they are emotionally interesting, concrete-experiential in nature, and imagery-provoking.

While many of these analyses focused on text, there is an abundance of negative and devaluing images of higher-weight bodies in news stories, in headlines of popular articles about health research (Lambert et al., 2019; Selensky et al., 2021), and even in peer reviewed work (Hill et al., 2021). Still, there is substantial evidence that viewing stereotypical images of individuals in higher-weight bodies is damaging for mental health and eating behavior (e.g., Sutin & Terracciano, 2013; Tomiyama et al., 2018) and is associated with greater anti-fat attitudes (e.g., Major et al., 2014) and a lack of evidence that it is motivating for participating in physical activity or other health-promoting behaviors remains. A randomized controlled trial conducted by Puhl and colleagues in 2013 found that across weight status and sociodemographic groups, health campaigns featuring stigmatizing images of overweight individuals did not promote motivation for health behavior change but was related to lower levels of self-efficacy. Additionally, Pearl, Dividio, and Puhl (2015) conducted a study where participants classified as overweight and non-overweight viewed stereotypical images of women classified as overweight (e.g., exhibiting sedentary behavior and eating calorie dense foods), images of overweight women exercising, images of overweight women in office settings, and images of thin women exercising. The stereotypical/stigmatizing images increased anti-fat attitudes in non-overweight participants, and did not increase exercise motivation in either overweight or non-overweight participants.

A content analysis of existing imagery surrounding higher-weight bodies and physical activity communication will inform the status of health communication relating to individuals in higher-weight bodies. One consideration in this pursuit is what

constitutes a stereotypical image and how intentional these health communications or images are. Images that show those in higher-weight bodies in greater distress than those in lower weight bodies when working out, images that feature those in lower-weight bodies engaging in rigorous activity while higher-weight bodies participating in more leisurely activities, or images where those in higher-weight bodies are depicted as having social support for their activities while thin bodies engage in PA by themselves, may all be detrimental differences that promote weight stereotyping and discrimination while discouraging physical activity for people living in higher-weight bodies. These types of images align with stereotypes relating to laziness and lack of self-motivation and may be implicitly chosen because of the prevalence of weight bias. Not only is weight bias and discrimination pervasive, research on populations where obesity is high (Marini et al., 2013) and in health and medical professionals (Phelan et al., 2014) demonstrate high levels of implicit weight bias. A content analysis assessing the current state of images in online health communication may help reveal aspects of communications on which even well-intentioned professionals in public health and physical activity organizations can improve. Because of the precedence for underrepresentation of higher-weight individuals in news, media, academic settings, health settings, and spaces for physical activity, and the discrimination and stereotyping that occurs when they are represented, it is important to understand the context and circumstances under which there are images of people in higher-weight bodies in physical activity communication and what characteristics are included in these images. To date, there is a scarcity of research synthesizing the discussions around individuals in higher-weight bodies on government or official public health websites. Online sources of information are becoming the most prominent places to look for health information, as such, these are vital medias to target for inclusivity of higher-weight individuals and see the potentially positive, effective health communications strategies that are currently being used, or how these medias perpetuate and promote ideals of weight discrimination and weight stereotypes.

Figure 2.1 Common-Sense Model of Self-Regulation.

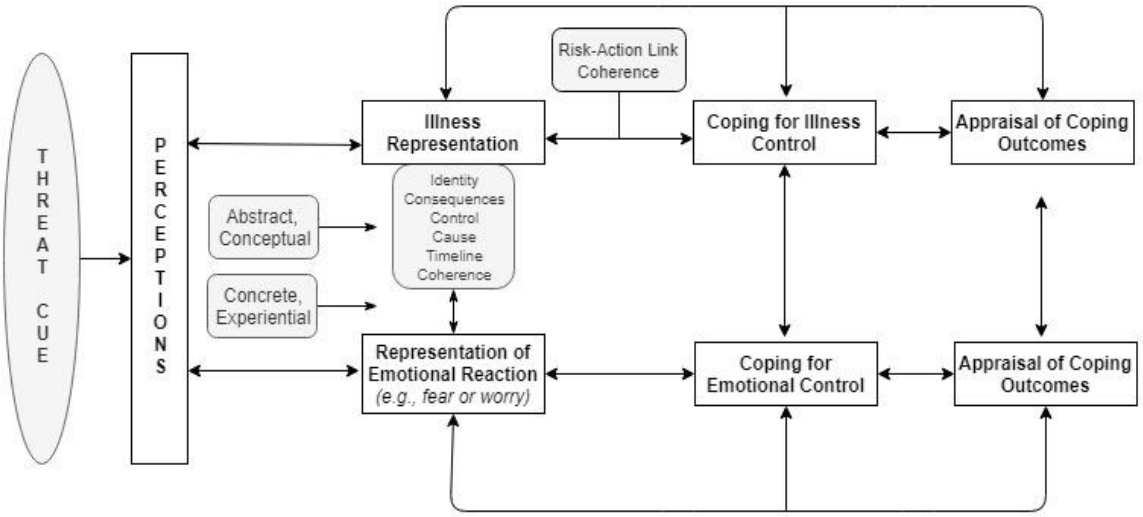


Table 2.1 Common-Sense Model Domains and Weight Representations

CSM Domain	CSM Description of Domain	Examples in Weight and Physical Activity Communications
Identity	Labels and symptoms of the condition	Visual portrayals of people in higher-weight bodies versus lower-weight bodies Characteristics of people in higher-weight bodies Terminology such as "people who need to lose weight" "people with obesity" Symptoms such as weight-related back pain or chronic illness related to weight
Timeline	Onset of symptoms and duration of the condition	Images depicting older individuals who are higher weight, suggesting that onset happens at older ages "Before" and "after" images suggesting weight status is dynamic Text and images depicting weight change as difficult, suggesting it is static
Personal Control	Preventability or treatability	Test and images conveying that physical activity can change weight status
Consequences	Outcomes of the condition	More exertion needed to be able to engage in physical activities Limitations as a result of weight status
Emotional Representation	Affective responses and expressions related to the condition	Depictions of weight-related anxiety, body dissatisfaction, and distress while being active

CHAPTER 3: CURRENT STUDY HYPOTHESES AND METHODS

Study Aims and Hypotheses

The aim of the current study is to investigate images that accompany physical activity health communications on health information websites and, more specifically, to investigate the portrayal of individuals in higher-weight bodies. The main research question is whether individuals in higher-weight bodies are underrepresented amongst the images of people on physical activity websites: (1) We hypothesized that there would be more non-overweight individuals than individuals who are perceived as overweight, thereby reflecting an overrepresentation of thin bodies when compared to the actual population. (2) We also have an exploratory hypothesis that higher-weight bodies would be more likely to be featured in images on public health government websites (PH) than physical activity organization (PA) websites. The robust literature demonstrating that higher-weight bodies are underrepresented in the media, a variety of entertainment mediums, and are not highlighted in spaces for physical activity, has informed these hypotheses (e.g., Himes & Thompson, 2007; Major et al., 2014).

Secondary research aims included tests of hypotheses regarding weight representations that are guided by the CSM (See Table 3.1 for hypotheses organized by CSM Domains). Literature suggests that it is believed individuals in higher-weight bodies cannot and do not enjoy participating in physical activity that is considered rigorous (e.g., Puhl & Huer, 2001; 2012), thus (3) we hypothesized that higher bodyweight status would be associated with activities that are less rigorous (identity). Research demonstrates that individuals in higher-weight bodies are considered unattractive and must be diligent to engage in appropriateness and hide their bodies if they do not want to experience body-related ridicule (e.g., Tomiyama, 2014). (4) We hypothesized that individuals in higher-weight bodies would be portrayed in more conservative or modest clothing (identity). Based upon previous research and practices of dehumanizing higher-weight individuals by cropping out their heads or zooming in to backsides and stomach regions, (5) we hypothesized that individuals in higher-weight bodies are more likely to be pictured in only a partial body (identity). These characteristics will help inform the identity domain of weight representations, and if the hypotheses are supported, they will be promoting weight stigma and stereotypical beliefs surrounding higher-weight individuals.

Because physical activity is largely marketed to higher-weight individuals through the goal of weight loss, (6) we hypothesized that images of higher-weight bodies are more likely to be in the context of weight loss (timeline). These images will be communicating the belief that higher-weight bodies need to change and can be changed over a period of time (timeline, duration). Additionally, (7) we hypothesized that adults in higher-weight bodies would be depicted as older than adults in non-higher-weight bodies (timeline, age of onset). Due to the prominent focus in health communication that individual behaviors can control weight or lead to weight loss, (8) we hypothesized that higher bodyweight status would be more likely to be in the context that it can be "treated" through exercise or behavioral methods (control beliefs). (9) We also hypothesized that individuals in higher-weight bodies will more frequently be pictured receiving social support in physical activity contexts. This hypothesis is informed by the pervasive belief and stereotype that individuals in higher weight bodies lack self-control or self-

motivation (e.g., Majors et al, 2020).

There are beliefs held by the general public and, more specifically, health care professionals, that individuals in higher-weight bodies physically struggle to engage in physical activity, have reduced mobility and physical abilities, and are so rarely active that when higher-weight individuals do partake in physical activity, it is particularly difficult (e.g., Puhl & Huer, 2001; 2012). These beliefs informed our hypothesis that (10) higher-weight bodies would be portrayed with higher levels of exertion while engaging in physical activity (consequences). Finally, (11) we hypothesized that individuals in higher-weight bodies would be depicted with greater distress surrounding physical activity due to the stereotypes that these individuals do not enjoy physical activity and are generally lazy (emotional representations). Additional variables we are interested include perceived gender, race/ethnicity, and skin color due to the intersectional relationship between weight and ethnicity. Discrimination, stigma, and stereotyping of individuals in higher-weight bodies can differ across race/ethnicity as well as across skin color (Himmelstein et al., 2017). Additionally, individuals belonging to the same racial/ethnic groups but who have differing skin colors can experience diverse experiences with discrimination (Burton et al., 2010; Dixon & Telles, 2017). Finally, non-Hispanic Black, Hispanic, and Non-Hispanic White are the groups with the respective highest prevalence of being considered overweight or obese, which is potentially relevant to the visual portrayal of individuals in health communication relating to bodyweight (CDC, 2022). We therefore coded for race/ethnicity and skin color to derive descriptive statistics regarding prevalence of depictions of individuals of different ethnicities and skin colors in public health and physical activity websites.

Method

Sample

The websites included for this study were based off the 2022 list of most visited physical activity websites including: Livestrong.com, Greatist, Self, Men's Health, and My Fitness Pal. This list comes from Aelieve One, a digital marketing company that collects data based upon website traffic and creates lists organized by number of unique visitors per year. These websites are categorized as physical activity (PA) Organization websites. An additional five websites based off the National Institute of Health's most trusted websites for health information were also accessed, including: The Center for Disease Control (CDC), The American Diabetes Association (ADA), World Health Organization (WHO), National institute of Health (NIH), and Health.gov, and these are classified as public health or government (PH) websites. These websites served as the main level of observation, providing ten, with the links to different webpages being included as well, if needed. To be as systematic as possible, the webpage links specifically tailored to be about fitness featured within these larger websites were included. To keep the data at a manageable size while still obtaining a representative sample, we only included links to other webpages that stem off the original main page of the website for PA websites. This included links with terms such as "fitness" "exercise" "workouts" "working out" "physical activity" "inactivity" and "sedentary." We also included links that indicate health communication surrounding more specific types of physical activity e.g., "hiking" "weightlifting" "running" etc. these types of

communications were more relevant for the PA websites rather than the PH ones. The data sample consists of screenshots of the main page of each website and screenshots of the subsequent relevant webpages to which the links lead us.

Eligibility Criteria

Screenshots include any image on the designated websites or webpages where there is a figure intended to be perceived as a human. The figure must have a discernable bodyweight status in order to be considered eligible, this includes actual photos of real humans or cartoon or animated depictions of humans. The images do not need to be of the full body, as long as there was enough to discern bodyweight status, to see the individual clearly, and, if the individual is perceived to be an adult. The webpage must contain NIH health communication elements, although some of the images on these webpages accompanied links that were for more commercial or advertisement purposes. Because they were included on the pages of health information and still in a physical activity health communication context, these images were also coded. The use of screenshots allows for data to be representative of the status of these websites in a specific period of time because links, headlines, and images featured on websites are constantly changing.

Procedure

The coding protocol was developed based upon the inclusion of the National Cancer Institute's elements of health communication, the domains of the CSM, Stunkard's Figure Rating Scale, and the descriptive characteristics of the images. This protocol was pilot tested by the primary researcher (KA) and the trained research assistant (FD). During this process, notes were taken and the coding was compared across researchers to see if further detail was needed or if further coding domains were required. Through this piloting process, we added several variables, including skin color. We realized that colorism is a relevant factor that can relate to race/ethnicity and be intersectional with weight. We also felt that discerning race/ethnicity from images was challenging but utilizing an established scale for skin color would be a useful addition to our extracted variables while still fitting in with our theoretical reasoning. Additionally, the keywords for clicking on additional links and webpages within each website were pilot tested and adjusted based upon investigation of each website and the relevant pages found there. Once the coding protocol and keywords for webpage link inclusion was piloted and revised as necessary, the search strategy began. See Appendix A for full search protocol.

Search Strategy

The ten websites identified included five PA websites: Livestrong, Greatist, Myfitnesspal, Self, and Men's Health; and the five PH websites: CDC, ADA, Health.gov, NIH, and WHO. These websites were accessed, and images selected utilizing a systematic search and selection process. To identify a relevant main webpage, each website name followed by "physical activity" was typed into the Google search engine (e.g., "Center for Disease Control physical activity"). The first link was then selected and accessed leading to a potential main PA related webpage for that specific website. This process was also conducted for the website name followed by "exercise" (e.g., Center for Disease Control exercise") and the website name followed by "fitness" (e.g., Center for Disease Control fitness). A main webpage was considered relevant if: (1) there was a

health communication as identified by the NIH about physical activity; (2) images were present; and (3) there were subsequent links to more specific or varying information related to physical activity. Each website had a main physical activity related webpage that met these criteria to serve as the main level of observation. If there were only a few images present on each webpage, then all of the included links that lead to subsequent webpages were accessed and all images were included in the final dataset. This was the case with the public health websites as they do not utilize many images, but often rely upon neutral infographics or only text-based communications. The Department of Health and Human Services has a detailed Physical Activity Guidelines and Recommendations PDF pamphlet. This pamphlet was featured on every public health website accessed and the front-page containing images of adults working out was included on each public health page as well. Because of the low count of images featured on the PH websites, the Physical Activity Guidelines PDF was also coded as its own unit and could be considered a "link" present on the main webpage of each PH site.

All images on each webpage were evaluated against the selection criteria previously discussed under eligibility criteria. We collected up to 50 images from each main website in total. In instances where after the main webpage (level 1) images were included and 50 images were still not gathered, a random number generator was utilized to access additional links until either 50 images were selected or there were no more relevant links to access, creating a level two observation for some of the websites. For most of the websites, 50 images were not able to be captured. Once identifying which webpages and how many levels were needed to gather as many eligible and relevant images from a main website, each eligible webpage was screen-captured, with all images on the webpage clearly visible. For the screen-captures in which there were multiple images, duplicates were made with each image labeled alphabetically. This labeling process allowed for researchers to be able to identify both the file and the exact image within each file and then which individual within each image for coding and data purposes. Screen-capture files with the images, organized by website and then webpage, make up the included final dataset. The primary researcher (KA) coded the images from all websites and the trained research assistant (FD) coded 20% in order to evaluate interrater reliability. To achieve this, the primary researcher randomly selected 20% of the photos from each website and sent to the second coder. The trained research assistant was blind to the hypotheses in order to achieve less biased coding. All screenshots were taken between June 6th, 2022, and August 6th, 2022.

Measures

Health Communication.

To be eligible for inclusion, the webpage was required to be coded as a health communication. This criterion was satisfied based off of the National Cancer Institute's guidelines for health communication elements including: increases knowledge and awareness, influences/changes norms, prompts action, demonstrates healthy skills, reinforces attitudes and knowledge, exemplifies benefit of behavior change, advocates health issue, raises support, refutes myths and misconceptions, and strengthens organizations (NCI, 2001).

Context of the Image

We coded for which website the image was from, the type of website (physical

activity or public health) and the type of webpage (1 = *general health/fitness,* 2 = *chronic illness,* 3 = *weight specific,* 4 = *gender specific,* 5 = *age specific,* or 6 = *cannot tell,* 100% agreement between coders). We also recorded the title of the webpage the image was featured on. We coded for type of activity being portrayed (e.g., running up a hill, walking along the beach with sandals in hand, swimming laps, ballroom style dancing, etc). Additional details such as the date the screenshot was taken, url, which image in the screenshot is being coded, and which individual within the image were also recorded.

Characteristics of the Individual in the Image

Demographic characteristics. We coded for race/ethnicity (white, Non-white, other; White, Latinx/a/o, Black, Asian, Pacific Peoples, Alaskan/Native America, Cannot tell) and gender (Man, Woman, Other). We also coded for clothing type (e.g., long sleeves and pants, short sleeves and capris/shorts, no shirt, baggy, and fitted) and affect of person portrayed based upon facial expression (0= *distressed,* 1 = *neutral,* 2 = *exertion,* 3 = *happy;* inter-rater reliability was high, with Cohen's $\kappa = .90$. Originally, the affect coding scheme did not include the option for "exertion"; after piloting, however, we determined that exertion must be included. Because these are images included in communications promoting physical activity, expressions of exertion were perceived as positive, almost empowering or demonstrations of strength. This item was left with all categories to get demographic information but was recoded for analyses purposes (see Emotional Representations).

Body Weight Status. Stunkard's Figure Rating Scale (FRS) was utilized to identify bodies that can be categorized as higher-weight or overweight (Stunkard, 1983; see Figure 3.1). This scale has most commonly been used for individuals to rate their body image and screen for body dysmorphia, but it is also included in other qualitative data research (Cardinal et al., 2006) and has been validated with a variety of populations (e.g., Conti et al., 2013). Other figure-rating scales have been adapted for use in body dissatisfaction research, but many share the characteristics of Stunkard's figure rating scale. It is recommended that for this scale, figures 1-2 depict someone who would be classified as underweight, images 3 and 4 are individuals of "normal" bodyweight, images 5 and 6 are individuals who would be classified as overweight and 7,8, and 9 are individuals who would be considered obese. A study of how BMI is visually perceived across different countries established exact BMI ranges for each figure in both Italy and Norway and found that the BMI ranges corresponded with the original intentions of each body figure (Wesnes et al., 2015). Stunkard's Figure Rating Scale will be referred to as "Body figure rating" throughout this manuscript. An additional measure of bodyweight status was "Would this person be perceived as overweight (based upon body fat composition, not large muscle mass)" (1 = *yes,* 0 = *no*). This measure was included because we expected that some bodies would score the same on the figure rating scale yet may still be perceived differently depending on body composition. Additionally, some of the men featured on the Men's Health webpage were larger bodied and would most likely mathematically have a weight status of overweight, but clearly had a very low body fat percentage, thus this item would provide an extra measure of perceptions of the individuals in the images. This variable will be referred to as "Perceived weight status" throughout this manuscript. The agreement between coders was high for both perceived

weight status (κ = .95) and body figure rating (r(138) = .96).

The Skin Color Scale. The Skin Color Scale (Massey & Martin, 2003) represents hands in the same size and position with increasing darkness. The scale ranges from 1 to 10 from lightness to darkness (see Figure 3.2). It is utilized across fields of study to examine self-identity, colorism, racism, and a variety of other related topics (e.g., Fuentes et al., 2021). The scale is widely used and, while there are reports of low interrater reliability, our interrater reliability score on this was considered high (r = .87). Additionally, discerning race/ethnicity from an image can be problematic and measuring skin color in addition to perceived race/ethnicity can provide a more nuanced description of the individual.

CSM Domain Characteristics

Identity. The characteristics that informed beliefs about identity were coded as follows: how rigorous the activity was (0 = *not at all rigorous* to 4 = *extremely rigorous*; [r = 1.00]); how modestly the individuals were dressed "These clothes are modest" (0 = *strongly disagree* to *4 = strongly agree*; [r = .87]); if it was a partial body in the image (0 = *no*, 1 = *yes;* [κ = .96]).

Timeline. The characteristics that informed timeline beliefs were coded as follows: whether the image was in the context of weight loss (duration: 0 = *no*, 1 = *yes*; [κ = .98]) and for age (age of onset: young adult, approximately 18-38; middle adult, approximately 39-59; older adult, approximately 60 and up; [κ = .95]).

Consequences. After piloting the coding scheme and protocol, a physical exertion rating (0 = *none* to 10 = *maximum effort*; [r = .82]) was also added (See Figure 3.3). This measure differs from the measure of rigor, as individuals in higher-weight bodies depicted as partaking in more rigorous activities would be a different message than individuals in higher-weight bodies displaying more signs of exertion, especially if the activities seem more leisurely or low impact. Thus, we felt this would inform the representational domain of consequences. This scale is used to evaluate the level of exertion from 1-10 by considering physical signs such as sweating, movement, out of breath, and being able to talk.

Control. The characteristics that informed control/treatability beliefs were coded as follows: "Is the image in the context that physical activity is a treatment for weight?" (0 = *no*, 1 = *yes*); "Is the individual in the image receiving social support?" (0 = *no*, 1 = *yes*). We also coded if physical activity is a treatment for something else (e.g., type 2 diabetes, stress, bone density, depression, etc.: 0 = *no*, 1 = *yes*). Cohen's Kappa indicated strong agreement for both context of physical activity as a treatment for weight (κ = .97) and as a treatment for something else (κ = .91), there was also strong agreement for receiving social support (κ = .97).

Emotional Representation. The characteristic that informed emotional representations surrounding weight status was the facial expression of the individual in the images. We recoded affect as distressed or not distressed to best test our hypothesis (0 = *no*, 1 = *yes*; [κ = .97]).

Statistical Analysis

Descriptive analyses were used to understand the context of the image and details about the images. This includes which type of website images came from, the type of webpage, being in the context of weight loss, being in the context of physical activity

"treating" weight, and the context of physical activity treating other conditions. Demographics of each individual pictured was also analyzed through descriptive analyses including: skin color, race/ethnicity, body figure rating, perceived weight status, rigor of activity being portrayed, modesty of clothing, full or partial body in the image, age of the individual, exertion of the individual, and affect of the individual. Body figure rating was treated as a continuous variable because each score is representative of a specific numerical BMI range. However, perceived weight status is a binary variable (yes/no). To compare expected proportion of different body weight statuses with observed proportion, chi-square analyses were utilized. Hypotheses investigating how body figure rating predicted a characteristic were analyzed using logistic regression for binary outcomes (full body in the image, context of weight loss, physical activity as a treatment for weight loss, receiving social support, and distressed affect) and correlation for continuous outcomes (e.g., rigor scale, modesty, and physical exertion scale). For analyses including perceived bodyweight status with a continuous outcome (e.g., rigor scale, modesty, and physical exertion score), we utilized t-tests, but if the outcome was also categorical then chi-square analyses were used. Although in most instances, the bodyweight status variables are considered the independent variables, there are others where it conceptually makes sense to have them serve as the outcome variables, (e.g., type of website the image was sourced from: PH or PA). For these analyses, the predictors are binary and categorical, thus an independent samples *t*-test was used to determine differences in body figure rating across type of website, and chi-square analysis was used to analyze the relationship between perceived weight status and website type. Cohen's Kappa was calculated for interrater reliability for categorical variables while Pearson's Correlation was used to obtain a correlation statistic(*r*) for continuous variables. All analyses were conducted in SPSS.

Table 3.1 Common-Sense Model Domains and Hypotheses

CSM Domain	CSM Description of Domain	Hypotheses Related to CSM Domain
Identity	Labels and symptoms of the condition	Higher-weight bodies associated with: Activities that are less rigorous Clothing that is more conservative or modest Increased likelihood of only a partial body portrayed
Timeline	Onset of symptoms and duration of the condition	Higher-weight bodies would be: More likely to be in the context of weight loss Portrayed as older than lower-weight individuals
Personal Control	Preventability or treatability	Higher-weight bodies would be more likely to be in the context that it can be "treated" through exercise or behavioral methods more frequently pictured receiving social support in physical activity contexts
Consequences	Outcomes of the condition	Higher-weight bodies would be portrayed with higher levels of exertion while engaging in physical activity
Emotional Representation	Affective responses and expressions related to the condition	Higher-weight bodies would be depicted with greater distress surrounding physical activity

Figure 3.1. Stunkard's Figure Rating Scale

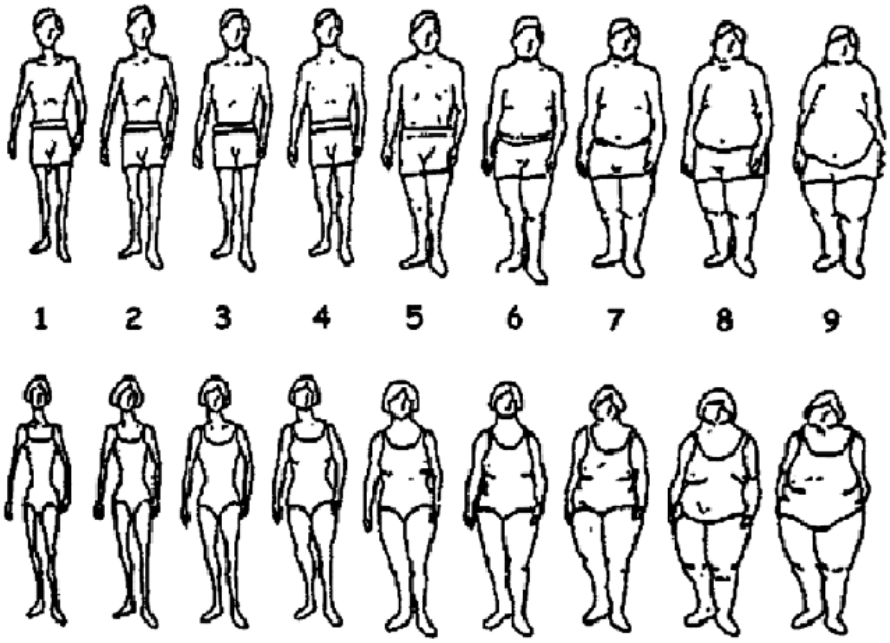


Figure 3.2

Figure 3.3 Physical Exertion Scale

Level	Exertion	Physical signs
0	None	None
1	Minimal	None
2	Barely there	Sensation of movement
3	Moderate	Stronger sensation of movement
4	Somewhat hard	Warmth or light sweating
5	Hard	Sweating
6	Harder	Moderate sweating
7	Very hard	Moderate sweating, but can still talk
8	Extremely hard	Heavy sweating, can't talk
9	Maximum effort	Very heavy sweating, can't talk
10	Maximum effort	Exhaustion

CHAPTER 4: RESULTS OF SEARCH STRATEGY AND HYPOTHESIS TESTING

Results

All public health websites used the term "Physical Activity" except for the American Diabetes Association whose relevant webpages were grouped under "Fitness". The individual bodies eligible to be coded from physical activity organization websites were found under the terms "Exercise" (n = 14) and "Fitness" (n = 304). A total of 240 screenshots resulted in 490 images of individuals able to be coded from the 10 websites. A total of 171 (34.9%) images of individuals came from public health and government websites while 319 (69.1%) images of individuals were coded from the physical activity organization websites (See Figure 4.1). A plurality of the webpages coded were communicating general fitness and health information (43.4%; See Figure 4.2) while gender-specific webpages comprised the second most common theme (30%; See Table 1 for breakdown of sample characteristics). Overall, 28.2% of images were coded as having the "ideal" bodyweight, which is represented by figure number "4" (a bodyweight status of normal), yet the highest percentage of individuals (31.3%) were coded as a "3" (lower end of a normal bodyweight status; See Table 2 for individual demographics). A majority of the individuals were coded as a young adult (53%), perceived as women (61.6%), and perceived as White (41.8%). From the total sample, 48% had most of their trunk or limbs covered or were wearing loose fitting clothing, 27.6% were rated as a "2" on the skin color scale, 43.7 % of the individuals were depicted as happy, and 54% of individuals were portrayed as not having social support.

Observed versus Expected Proportions of Bodyweight Status

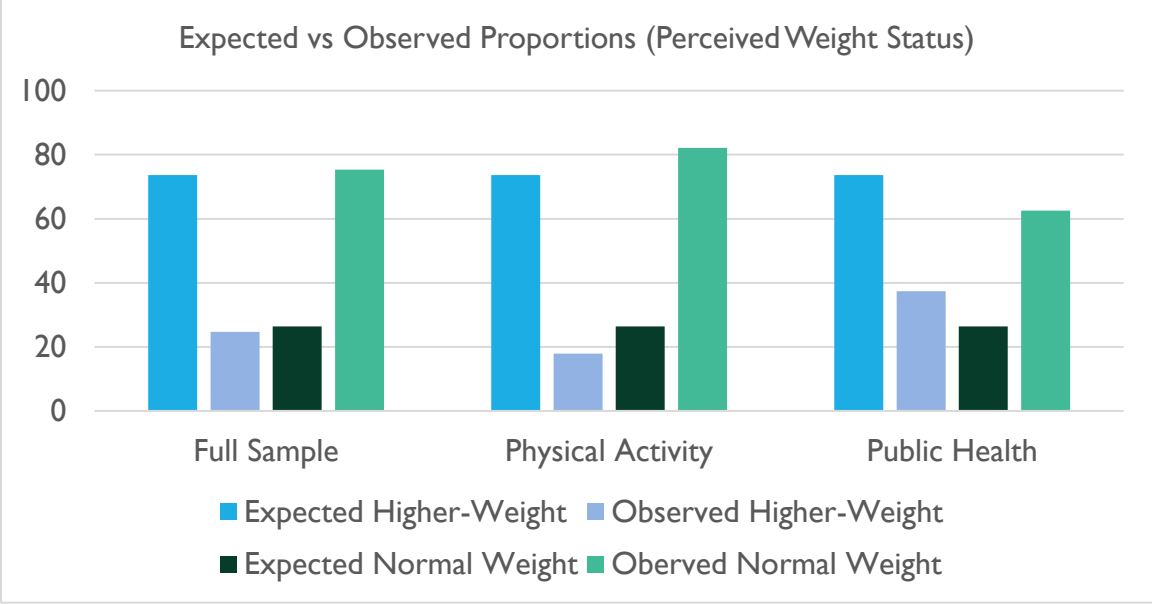
Total Sample

A chi-square test of perceived weight status indicated that the expected percentage of higher-weight individuals (73.6%) was significantly higher than the observed percentage (24.7%) and the expected percentage of non-overweight individuals (26.4%) was significantly lower than the observed percentage (75.3%; $X^2[1, N = 490) = 603.171$, $p < .00$; see figure 4.2). An additional chi-square test of bodyweight status as measured by the body figure ratings indicates that the expected percentage of higher-weight individuals (73.6%) was significantly higher than the observed percentage (26.6%) and the observed percentage of under- (14%) and normal (56.1%) weight individuals were significantly higher than expected underweight (1.6%) and expected normal weight (24.7) percentages ($X^2[2, N = 490) = 873.928$, $p < .001$). These chi-square test results support the hypothesis that higher-weight individuals would be underrepresented. Approximately 73.6% of American adults are considered overweight or obese, while we cannot discern BMI from images, only 24.7% of the individuals pictured were coded "Yes" for "Would this person be perceived as overweight". Further, Stunkard's Figure Rating Scale indicates that a body figure rating equal to 5 or higher reflects an individual who may be categorized as overweight or obese; in the present sample of images, 26.6% of individuals were coded as a score of 5 or higher, which is also well below the estimated 73.6% of American adults. Perceived weight status and body figure rating were strongly correlated, $r(488) = .795$, $p < .001$.

Exploratory analyses to investigate how observed and expected proportions of

higher-weight bodies may have differed across website, rather than the entire sample, a series of chi-square analyses were conducted. A chi-square test of bodyweight status as measured by the perceived weight status categorization indicates that the expected percentage of higher-weight individuals (73.6%) featured on the PH websites was significantly higher than the observed percentage (38.5%) and the observed percentage of under- (9.33%) and normal (52.0%) weight individuals were significantly higher than expected ($X^2[2, N = 171) = 143.959$, $p < .001$). An additional chi-square test of perceived weight status indicates that the expected percentage of higher-weight individuals (73.6%) featured on PH websites was significantly higher than the observed percentage (37.4%) and the expected percentage of non-overweight individuals (26.4%) was significantly lower than observed (62.6%; ($X^2[1, N = 171) = 115.156$, $p < .001$). Further, the chi-square test of body figure rating indicates that the expected percentage (73.6%) of higher-weight individuals featured on the PA websites was significantly higher than the observed percentage (20.1%) and the observed percentage of under- (16.9%) and normal (63.0%) weight individuals were significantly higher than expected ($X^2[2, N = 319) = 780.443$, $p < .001$). An additional chi-square test of perceived weight status indicates that the expected percentage of higher-weight individuals featured on PA websites was significantly lower than the observed percentage (17.9%) and the observed percentage of normal weight individuals (82.1%) was significantly higher than expected ($X^2[1, N = 319) = 518.680$, $p < .001$).

Figure 4.3 Bar graph of expected versus exposed proportions of higher- and non-higher-weight individuals found in the total sample and by type of website.



Physical Activity Organizations and Public Health Government Websites

To test if there is a difference in bodyweight status across PA and PH websites, an

independent samples t-test was utilized. The body figure rating for images on public health websites (M = 4.44, SD = 1.74) were significantly higher than those from the physical activity organization websites (M =. 3.73, SD = 1.46; (t[488] = 5.52, p < .001). Further, a chi-square test of bodyweight status as measured by the perceived weight status categorization indicated that the PH websites portrayed a greater proportion of higher-weight individuals (37.40%) than the PA websites did (17.90%; (X^2[1, N = 490) = 22.901, p <.001. These analyses support the hypotheses that PH websites would portray a significantly higher proportion of higher-weight individuals than the PA websites.

CSM Guided Weight Representation Hypotheses

Identity. To test the hypothesis that higher bodyweight status would be associated with less rigorous physical activity, we first conducted a correlation analysis testing the associations of body figure ratings with rigor scores. The analysis revealed that there was no significant association between body figure ratings and rigor scores r(486) = -.064, p = .161). Second, we conducted an independent samples t-test testing for differences in rigor rating as a function of perceived weight status. This analysis revealed that rigor ratings were not significantly different for individuals perceived as overweight or obese (M = 1.97, SD = .747) than for individuals who were not (M = 2.12, SD = 1.026); t(484) = 1.53, p = .126).

To test the hypothesis that individuals of higher bodyweight status would be wearing more modest clothing, we first conducted a correlation analysis testing the associations of body figure ratings with modesty ratings. The analysis revealed a small positive correlation such that as body figure rating increases so does the modesty of their clothing r(485) = .110, p = .015. An independent samples t-test comparing degree of modesty across perceived bodyweight status was significant (t(483) = -3.164, p = .002). Individuals perceived as overweight had higher modesty ratings (M = 2.62, SD = 1.23) relative to those perceived as not overweight (M = 2.22, SD = 1.12). Overall, the hypothesis that individuals in higher-weight bodies would be portrayed in more modest clothing was supported for both the body figure ratings and perceived weight status.

To test the hypothesis that higher-weight individuals would be more likely to be pictured without a full body, logistic regression analyzed the relationship between body figure ratings and whether a complete body was included in the image. There was no significant relationship between body figure ratings and amount of body included in the image (OR = .973, 95%CI [.865,1.095], p < .01). The chi-square for the model was also non-significant (X^2(1, N = 490) = .209, p = .607). A Chi-square test of independence was used to investigate the relationship between perceived weight status and whether a complete body was in the image. There was no relationship between perceived weight status and portion of body included in the image (X^2[1, N = 490) = .003, p = .953). Of the individuals who were perceived as overweight, 67.7% of them were portrayed with their complete body, whereas 67.5% of individuals who were not perceived as overweight had their complete body included in the photo.

Timeline. To test the hypothesis that individuals in higher-weight bodies would be depicted as older, a correlation between figure rating score and age was conducted. Results indicate that there was not a significant relationship between body figure rating and age r(465) = .064, p = .168. A chi-square test of independence was used to test this hypothesis for perceived weight status, and we found there was a significant relationship

between perceived weight status and age ($X^2(2, N = 465) = 9.093, p = .011$). For individuals perceived as overweight, 45% were coded as young adults, 35.77% were coded as middle aged, and 19.30% were coded as older adult, whereas 60.1% of individuals not perceived as overweight were coded as young adult, 22.7% of individuals were coded as middle adult age, and 17.1% were coded as older adult.

To test the hypothesis that individuals with higher-weight bodies would be more likely to be present in the context of weight loss, logistic regression analyses between body figure rating and context of weight loss were conducted. Analyses revealed that higher body figure ratings are associated with higher odds of being in the context of weight loss (OR=1.495, 95%CI [1.28, 1.74], p <.01). The chi square for this model was also significant, ($X^2[1, N = 490) = 26.15, p < .001$. Further, a chi-square test of independence revealed that there is a significant relationship between perceived weight status and being in the context of weight loss ($X^2[1, N = 490) = 17.107, p < .001$. Among individuals perceived as overweight, 23.9% were portrayed in the context of weight loss, whereas 9.2% of individuals not perceived as overweight were portrayed in the context of weight loss.

Control. To test the hypothesis that higher-weight bodies will be portrayed in the context of physical activity treating weight, we first used body figure rating and context of physical activity treating weight in logistic regression analyses. Logistic regression indicated that higher body figure ratings were associated with greater odds that the photo is in the context that physical activity is a treatment for higher-weight status (OR = 1.43, 95% CI [1.231, 1.665], $p < .001$). Chi-square results suggest that the regression model was significant ($X^2[1, N = 490] = 21.368, p < .001$). Next, a chi-square test of independence was conducted to see if context of physical activity as a treatment was related to perceived weight status. Perceived weight status was related to physical activity treating weight X^2 (1, $N = 489) = 12.807, p < .001$). Of individuals perceived to be overweight, 76.8% were in the context of physical activity treating weight, whereas for those not perceived as overweight, 10.32% were portrayed in this context.

To test the hypothesis that those in higher-weight bodies are more likely to be pictured as receiving social support, we first tested logistic regression analyses between body figure rating and whether the individual was receiving social support in the image, for which the full model was significant ($X^2[1, N = 490) = 6.313, p = .02$. Results indicate that higher body figure rating is associated with lower likelihood of receiving social support (OR = .863, 95%CI [.768, .970]). However, chi square analyses revealed a a non-significant relationship between perceived weight status and receiving social support ($X^2[1, N = 490) = 3.54, p = .06$. Among individuals who were perceived as overweight, 34.28% were pictured as receiving social support, whereas 44.44% of individuals who were not perceived as overweight were portrayed as receiving social support.

Consequences. To test the hypothesis that higher-weight bodies would be pictured as exerting themselves more to be able to engage in physical activity, a correlation between body figure rating and physical exertion score was conducted. There was no significant correlation found between body figure rating and the physical exertion scale; $r(484) = .057, p = .214$. Further, independent samples t-test indicate that there was no significant difference ($t(482) = 1.151, p = .252$) in physical exertion score between individuals perceived as overweight ($M = 4.09, SD = 1.541$) and individuals not perceived as

overweight (M = 4.09, SD = 1.54).

Emotional Representation. To test the hypothesis that those in higher-weight bodies would be more likely to be pictured in distress over physical activity, logistic regression was utilized. There was no significant relationship between body figure rating and likelihood of distress (OR = .904, 95% CI [.543, 1.504], p = .697) and the full model was not significant (X^2[1, N = 490) = .159, p = .690. Additionally, a chi-square test of independence indicated no relationship between affect and perceived weight status, (X^2 (1, N = 450) = .325, p = .568). Among individuals who were perceived as overweight, 1% were not portrayed as distressed, while 1.8% of individuals not perceived as overweight were portrayed as distressed.

Figure 4.1 Proportion of Images from Public Health Websites vs. Physical Activity Websites

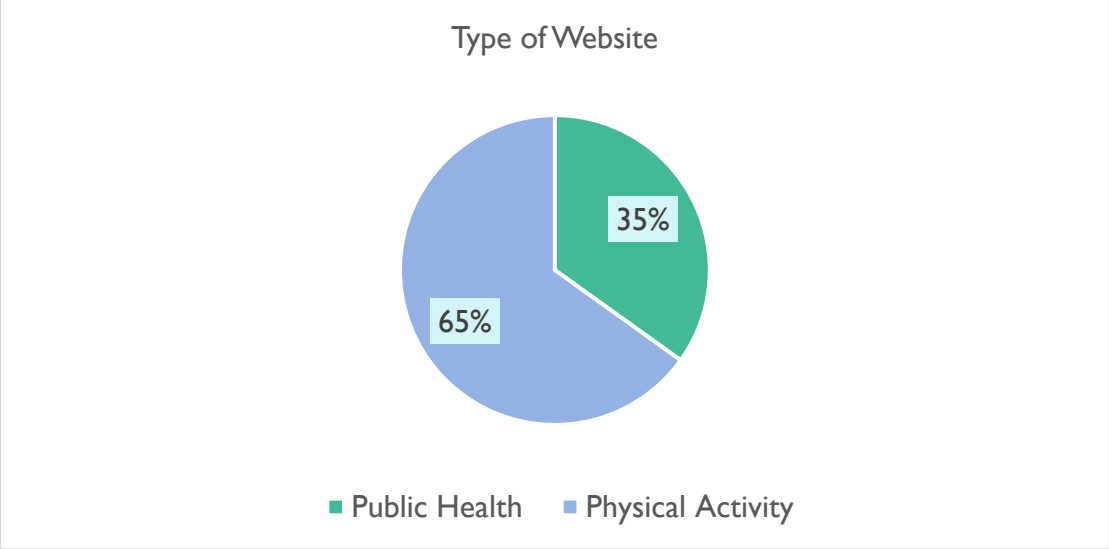


Figure 4.2 Proportion of Images Featured on Each Type of Webpage

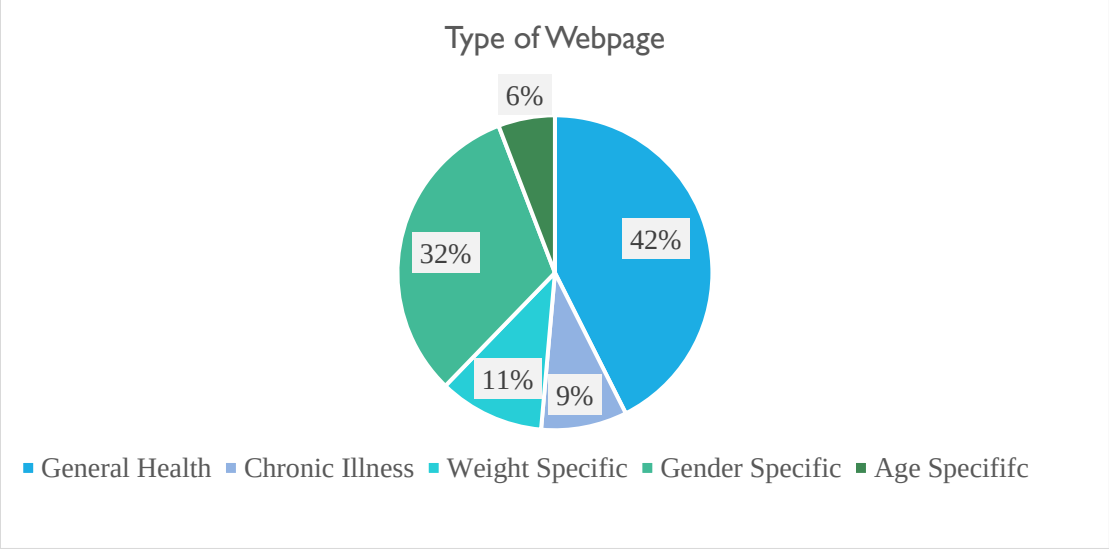


Table 4.1 Sample Characteristics

Variable	Frequency/Percentage
Type of Webpage	N = 490
General Health/Fitness	212 (43.3%)
Chronic Illness	44 (9%)
Weight Specific	54 (11%)
Gender Specific	150 (30.6%)
Age Specific	29 (5.9%)
Context of Weight loss	N = 490
Yes	63 (12.9%)
No	427 (87.1%)
Level of Exertion	N = 484
0	14 (2.9%)
1	40 (8.2%)
2	40 (8.2%)
3	61 (12.4%)
4	131 (26.7%)
5	67 (13.7%)
6	53 (10.8%)
7	37 (7.6%)
8	34 (6.9%)
9	7 (1.4%)
Full Body in Photo	N = 490
Yes	331 (67.6%)
No	159 (32.4%)
Receiving Social Support	N = 490
Yes	206 (42%)
No	284 (58%)
Physical Activity Treats Weight	N = 489
Yes	66 (13.5%)
No	423 (86.3%)
Affect/Facial Expression	N = 490
Distressed	7 (1.4%)
Neutral	160 (32.7%)

Exerting/effort	69 (14.1%)
Happy	214 (43.7%)

Table 4.2 Demographics Table

Variable	Percentages	Frequency/Percentage	
Body Figure Rating	Overall (N=490)	PH (N=171)	PA (N=319)
1 (indicates underweight)	1.20 %	2 (1.17%)	4 (1.25%)
2 (indicates underweight)	13.1 %	14 (8.15%)	50 (15.67%)
3 (“normal” weight)	31.0 %	43 (25.15%)	109 (34.17%)
4 (“normal” weight)	28.2 %	46 (26.9%)	92 (28.8%)
5 (indicates overweight)	8.8 %	20 (11.69%)	23 (7.21%)
6 (indicates overweight)	7.8 %	18 (10.52%)	20 (6.27%)
7 (indicates obesity)	5.7 %	2 (1.17%)	16 (5.01%)
8 (indicates obesity)	4.3 %	9 (5.26%)	12 (3.76%)
9 (indicates severe obesity)	0 %	0 (0%)	0 (0%)
Skin Color			
1	17.6%	38 (22.22%)	48 (15.04%)
2	27.6 %	50 (29.24%)	85 (26.64%)
3	22.2 %	29 (16.95%)	80 (25.07%)
4	9.0 %	13 (7.60%)	31 (9.72%)
5	9.0 %	17 (9.94%)	27 (7.84%)
6	8.4%	15 (8.77%)	26 (5.26%)
7	3.5 %	4 (2.34%)	12 (8.15%)
8	1.4 %	1 (.58%)	6 (1.88%)
Gender			
Man	37.8 %	61 (35.57%)	124 (38.87%)
Woman	61.6%	108 (63.2%)	194 (60.8%)
Other	.2 %	1 (.58%)	0 (0%)
Not Applicable	.4 %	1 (.58%)	1 (3.13%)
Age			
Young Adult	53.4 %	49 (28.61%)	214 (67.08%)
Middle Adult	24.6%	61 (35.67%)	59 (18.49%)
Older Adult	16.8 %	58 (33.92%)	24 (7.52%)
Perceived Weight Status			
Yes	24.7%	64 (37.42%)	57 (17.86%)
No	75.3%	107 (62.57%)	262 (82.13%)
Perceived Race/Ethnicity			
Hispanic/Latinx	3.2%		
Asian	8.6%		
Black	23.5%		
White	41.8%		
Pacific Peoples	.4%		
Cannot Tell	20.8%		

CHAPTER 5: DISCUSSION, LIMITATIONS, AND FUTURE DIRECTIONS

General Overview

In the investigation of imagery used in physical activity health communications, many characteristics that can inform health domains were identified. This included patterns that are consistent with weight stigma, as well as patterns that are consistent with inclusivity, or counter-stereotypes. Several of the hypotheses were supported, while some were only partially supported, and others were contrarian. In this chapter, we will address each hypothesis and the results from testing them and discuss these findings in relation to the existing literature. There will also be a discussion of theoretical and translational implications of the study, study strengths and limitations, and future directions and conclusions.

Hypothesis Testing

Expected and Observed proportions of higher-weight individuals

The main objective of this content analysis was to investigate the portrayal of higher-weight bodies in images used in physical activity health communication. Thus, the first hypothesis was that higher-weight individuals would be underrepresented, and that thin or normal weight individuals would be overrepresented when compared to US population proportions. We found that when compared to expected proportions based upon 2018 Center for Disease Control data, overweight and obese individuals were underrepresented whereas normal and underweight individuals were overrepresented. While some may believe that this is to be expected due to the nature of the health behavior of interest, physical activity, being associated with lower body fat percentages (e.g., Bradbury et al., 2006), it has important implications for health communication. Research has demonstrated that identifying with and seeing a model who has similar physical attributes to oneself can increase the likelihood that an individual will relate to the model and their intentions to engage in that behavior can increase (Gerrard & Gibbons, 2013). Further, a lack of higher-weight individuals present in physical activity health communication may promote discriminatory practices and stereotypes. Specifically, the discrimination and exclusion of individuals in higher-weight bodies in physical activity spaces (e.g., weight machines not fitting people in higher-weight bodies, other equipment having size limitations, general anti-fat attitudes perceived from fitness employees and other patrons of physical activity arenas; Major et al., 2014; Zuest et al., 2022).

Considering that higher-weight individuals are underrepresented in news and entertainment media (Shinoda et al., 2021; Ata & Thompson, 2010), it may seem obvious that higher-weight people would be underrepresented in health communications from physical activity websites such as Self and Men’s Health. However, the discrepancy between the actual population, and observed higher-weight bodies on these sites is noteworthy. While public health organization websites were more likely to portray higher-weight individuals than physical activity organization websites, both types

portrayed significantly higher underweight and normal weight bodies than the population and significantly less higher-weight bodies.

CSM Domains

Identity. The first hypothesis tested to investigate characteristics that would inform the identity domain was focused on rigor of the physical activity being depicted in the images, and if this level of rigor was different across bodyweight status. We hypothesized that higher-weight individuals would be depicted as participating in less rigorous activity, but this was not supported. This is potentially positive news for the state of physical activity health communication. Throughout the websites, the images of higher-weight individuals participating in challenging, difficult, physical activities may empower higher-weight individuals who identify with the bodies in the images. However, some research suggests that offering alternatives to rigorous activities, such as walking, swimming, and more leisurely styles of yoga, is an essential strategy to increase the accessibility of and reduce barriers to physical activity (e.g., Qui & Zhang, 2020). The current study findings do not indicate that individuals in higher-weight bodies were only portrayed engaging in rigorous activities, but that there was no difference in rigor across bodyweight status. Portraying individuals in a variety of bodyweight status participating in a range of more leisurely to more rigorous activities is indicative of ideals that differ from stigmatizing beliefs.

Additionally, we hypothesized that individuals with higher-weight bodies would be dressed more modestly than their normal-weight counterparts, and the results supported this hypothesis. This choice of utilizing photos of higher-weight individuals in more modest clothing may perpetuate the stigmatizing belief that higher-weight individuals should cover their body or are less attractive (e.g., Puhl & Heuer, 2001; 2012). Interestingly, research has shown that depicting images of individuals in higher-weight bodies in a counter stereotypical way can be related to higher instances of weight stigma (Pearl et al., 2013) by portraying these individuals in more modest clothes, it is seemingly promoting weight bias, however it may also be inadvertently avoiding increased stigma. Research on other types of diversity (e.g., sexual identity and racial/ethnic diversity) suggests that being exposed to diverse individuals can help to familiarize oneself with a different population, and can reduce prejudice and discrimination (e.g., Killen et al., 2021). Thus, visually seeing higher-weight bodies in a variety of clothing types may be uncomfortable at first, and then act as catalysts for a reduction in anti-fat ideals.

The hypothesis that higher-weight individuals would be more likely to be portrayed in incomplete-bodies was informed by prevalent findings in other content analyses of news and entertainment media (e.g., Greenburg et al., 2003; Selensky & Cerels, 2022) however, we did not find this relationship. This is further evidence that health communication strategies surrounding individuals in higher-weight bodies are less stigmatizing, and that dehumanization of this group may not be as prevalent as it was in past years.

Timeline. We hypothesized that age and weight status would be positively related, and this was partially supported by results. Analyses revealed that middle adults were the age group most likely to be considered overweight and to have higher body figure ratings when compared to young and older adults. This suggests to someone

developing weight representations that age of onset of becoming higher-weight occurs in middle adulthood rather than young adulthood. However, this may also inadvertently support the second hypothesis related to timeline, that bodyweight is dynamic, because older adults were portrayed as significantly lower-weight than middle. Even though these were not the same individuals in a "before and after" context, the message of higher-weight middle adults and non-higher-weight older adults may inform weight representations in a similar manner.

It was also hypothesized that higher-weight individuals would be represented in the context of weight loss, which would inform the timeline domain of weight representations that weight can be dynamic. This was supported by analyses that found higher body figure ratings were associated with greater odds of being in the context of weight loss. While some of the characteristics that may inform weight representations are clearly pejorative, others are not as clearly labeled. For example, research demonstrates that health communications in the context of weight loss are perceived as stigmatizing and individuals in higher-weight bodies are not significantly more likely to engage in health behaviors when they are framed in the context of weight loss (e.g., Thomas et al., 2010).

However, there is also research demonstrating that moderate weight loss can result in clinically significant improvements in a variety of health measurements such as, cholesterol, blood pressure, blood sugar levels, heart function, and heart structure (e.g., Delahanty et al., 2014; De Las Fuentes et al., 2009) and a barrier to weight loss is low self-efficacy and external locus of control surrounding ability to change diet and physical activity. Demonstrating that higher-weight can be temporary, may have been an intentional attempt at increasing perceived personal control, which is a domain that can be associated with positive behavior change. Simultaneously, a high percentage of individuals, especially women, are constantly trying to lose weight. A CDC survey in 2018 found that 56% of women and 41.7% of men had tried to restrict their calories with the goal of losing weight in the past year. Research has demonstrated that weight loss is rarely sustained and can be associated with weight cycling (when weight is gained, lost, regained, etc.) which has been found to put stress on the heart, cause hormone dysregulation, and is associated with increased blood pressure, higher levels of reported stress and higher body dissatisfaction levels (Anastasiou, 2015; Brown, 2015). Thus, the idea that weight is dynamic could potentially be promoting ideas that weight can/should be altered and inspire behavior related to physical and psychological damage through constant weight cycling. These potential impacts of health communication demonstrate the importance of further research on how different types of health communication can impact a variety of populations.

Control. The hypothesis that those in higher-weight bodies would be featured in the context of physical activity treating weight was supported by the results. Higher body figure ratings were associated with higher likelihood of being in the context of physical activity treating weight. This variable was specifically if the text surrounding the images discussed physical activity as a treatment for weight status. The implications are similar to context of weight loss in that communications surrounding weight loss are less likely to be adhered to and potentially less motivating for individuals in higher-weight bodies, thus it would not seem effective to be using images of higher-weight individuals in these

contexts. Additionally, portraying higher-weight individuals in this context of treating weight with physical activity, could inform beliefs and stereotypes that individuals who are of higher weight should be physically active with the end goal of weight loss as opposed to another beneficial outcome. Research demonstrates that focusing the blame on personal behavior is perceived as stigmatizing to higher-weight individuals (Campo & Maston, 2007), yet research also suggests that increased perceptions of personal control is related to increased willingness to engage in the health behavior of interest (e.g., Schuz et al., 2010). Weight status is influenced by social, biological, structural, and behavioral factors, and simply focusing on the behavioral factors can promote negative stereotypes for those in higher-weight bodies and spread misinformation.

We also hypothesized that individuals in higher-weight bodies would be more likely to be pictured as receiving social support in the context of physical activity, and this was not supported by analyses. Alternatively, individuals with lower body figure ratings and who were not perceived as overweight were more likely to be depicted as receiving social support. This could potentially be attributed to other contextual characteristics of higher-weight versus non-higher-weight individuals and how they were presented in these images. Additionally, perhaps social support is not as prominent in the existing implicit or explicit bias in the individuals who create and utilize these communications. However, this pattern could also be informed by, or promote the stereotype that individuals in larger bodies have less friends and are less desirable to spend time with. Research has demonstrated that the public expresses feelings of wanting to socially isolate from higher-bodied individuals and see them as less socially desirable and less likely to participate in social events and physical activity (e.g., Frederick et al., 2016; Mclure et al., 2011). This pattern of seeing non-higher weight individuals with more social support than higher-weight individuals has the potential to promote harmful stereotypes and anti-fat bias surrounding social status, while it simultaneously does not promote ideals that those in higher-weight bodies require social support or external motivation to be active.

Consequences. One of the potential perceived consequences of being overweight is that physical activity requires more effort, thus, we hypothesized that individuals in higher-weight bodies would be portrayed of having to have higher levels of exertion when engaging in physical activity. However, our hypothesis was not supported by the results. There was no difference in exertion across body figure ratings or perceived weight status.

Emotional Representation. Finally, it was hypothesized that those in higher-weight bodies would show greater distress surrounding physical activity. Which would inform the emotional representation of weight as well as be in line with the stereotypes that individuals in higher-weight bodies do not enjoy working out. Contrary to hypotheses, individuals in higher-weight bodies were not portrayed as in more distress than other individuals. This, along with no relationship between bodyweight status variables and rigor of activity or exertion, are contrary to stereotypes held surrounding higher-weight individuals and physical activity. It is a potentially positive sign that these stereotypes were not represented in the health communications sampled for this current study.

Implications of the Current Study

Understanding the causes, treatments, illnesses, and other factors related to being higher-weight has been a focal point for medical, social, and psychological research in recent news. There are theories surrounding how to motivate successful weight loss and theories of how we should no longer promote weight-loss at all but rather focus on different aspects of health (e.g., health at every size). However, it has rarely been discussed how we can combine weight stigma literature with classic behavior change theories and health communication techniques (e.g., imagery) to create more effective health communications targeted for individuals in higher-weight bodies. Some of the characteristics included in the current study are examples of the prevalence of weight stigma that occurs in our health communication, whether it is intentional or not. However, other aspects are not as clear if they would fall under stigmatizing or potentially motivating behaviors (not necessarily mutually exclusive) depending on the other strategies combined. More experimental studies are needed to see under which circumstances which types of physical activity communications are more effective. This study exemplifies how the CSM can be used to understand how illness or health representations may be formed by stereotypical characteristics or other potentially harmful components included in health communication. It also offers a unique interpretation of weight representations that are not focused on obesity as an illness, but rather on weight status, itself. This strategy would be applicable in understanding how other health communications, advertising, and patient-physician interactions (among others) inform weight representations and may contribute to internalized weight-bias or unhealthful coping behaviors.

Recommendations

This research in a practical sense can act as a call to action for both physical activity organizations and public health websites to be more inclusive of higher-weight individuals in the images chosen in their health communications. Further, this area of research may prompt health professionals to be mindful of how, even implicit, weight bias may be infiltrating their health communication efforts. There are several strategies to reduce weight stigma in images used in health communication: (1) portray individuals in higher-and normal weight bodies in a wide variety of clothing, (2) with and without social support, and (3) in a variety of genders, ages, and ethnicities. Additionally, it may be beneficial to be segmented in the communications, so that those looking for different types of health information may find webpages that have intentional communications most beneficial for that population. It is important to note that even with segmented communications, it is essential to have a variety of individuals portrayed (i.e., on a diabetes specific page or one dedicated to workouts easy on the joints, diverse age and body compositions must still be depicted). Other beneficial strategies to reduce stigma in health communication would be to pull from community-based research and marketing techniques and create focus groups to discuss the images and accompanying text chosen. This may help reduce instances where implicit bias has influenced the images chosen and help to create more targeted, effective messaging for intended populations.

Strengths, Limitations, and Future Directions

This study is the first to conduct a content analysis of imagery and physical activity health communication across online health information websites through the context of higher-weight individuals. This study demonstrates how important it is to use

weight stigma work to inform our interventions and health communications. Limitations include that there was an abundance of nuanced information available for coding that was outside the scope of this dissertation. While the text was considered, a full analysis of both the text and imagery used could have provided a more detailed snapshot of what these communications contained. Moreover, including all CSM representational domains, such as *cause* and *coherence* would offer valuable insight into the effectiveness and inclusiveness of health communication attempts. Future content analyses would be contributing to the body of literature to conduct these more thorough investigations.

Further, interrater reliability was very high, which is a strength to the study, however raters from a more diverse background could have been beneficial. Both coders were between the age of 20 and 30, from California, and are of Latinx race/ethnicity. Raters from a different background may have perceived the coded characteristics differently. While the second coder was blind to the hypotheses and there was still a high level of agreement, it may also be a limitation that the PI who coded all the images used in the analyses was aware of the hypotheses. Adding more coders who are blind to the hypotheses and to code a larger percentage of the images may help alleviate concerns of coding bias. However, 20% is well within the current gold standard for interrater reliability. Because several of the images were taken from the same a website, a random effects model analyses may be an effective way to take into account images nested within webpage and website, and allow for the more nuanced relationships between specific characteristics and types of websites to be understood.

Other more anecdotal characteristics that were not hypothesized were noted throughout the coding process that offer relevant and important information. For example, on the Men's Health website, only one individual from the entire Men's Health dataset was coded as overweight, and this individual was featured under the context that he is one of the strongest men in the world. Even on the weight loss dedicated pages only "After" images were displayed. Meanwhile, on the Self magazine website, which is a health magazine geared towards mainly women, there were several overweight women portrayed in a variety of activities and clothing. Further analyzing these nuanced, but seemingly important differences and details would help form a more accurate representation of the status of how higher-weight individuals are portrayed in physical activity health communications. This noted phenomena is also further proof that more intersectional research on weight stigma, health communications, and health behaviors is needed. The current study did provide frequencies for skin color, gender, and perceived race/ethnicity, but more hypotheses on intersectionality would enrich future research. It is reasonable to hypothesize that the images with more stereotypical characteristics are promoting weight stigma and discrimination, and alienating individuals in higher-weight bodies based on previous literature. However, the body of work that investigates stigmatizing images in health communications and how this impacts their effectiveness is still emerging. Future directions include conducting experiments where different health communication strategies and images are utilized amongst both a broader population (as previously discussed, weight stigma impacts everyone) as well as higher-weight populations, specifically. Several of the study characteristics can be classified as stigmatizing, however, it is relatively unknown the exact impacts of the images included in physical activity health communication on behavior, further research is needed to

examine the role images have in health communications and populations of higher-weight individuals.

Final Comments

In the investigation of the status of images used in online physical activity health communications, higher-weight individuals were fund to be underrepresented, dressed more modestly, more likely to be present in the context of weight loss and the context that physical activity is a treatment for weight, and were less likely to be shown as receiving social support than their under-or normal weight counterparts. They were also more likely to be portrayed as middle adults as opposed to younger or older adult age. However, there was no difference in rigor of activity, distressed affect, exertion levels, or whether the full body was pictured, across bodyweight status. Individuals in higher-weight bodies experience high levels of weight stigma, discrimination, and stereotyping, especially in health and physical activity settings. They are a vital population to target with inclusive, effective health messaging about a variety of health behaviors, especially physical activity, which is a health behavior already shrouded in stigma for this population. As such, it is imperative that characteristics that inform weight representations are not discriminatory or promoting of negative stereotypes. While many health officials and researchers are aware of the prevalence of weight stigma, it is essential that studies include measures of perceived weight stigma in their work, and be mindful of weight stigma in their research, intervention development, and clinical practice.

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APPENDIX A

Search Strategy Protocol and Inclusion/Exclusion Criteria

The ten websites identified included five physical activity organization websites: Livestrong, Shape, Self, Greatist, and Men's Health; and the five public health websites: CDC, ADA, WHO, NIH, and healthfinder.gov. These physical activity websites were accessed and images selected utilizing a systematic search and selection process.

In order to identify a relevant main webpage, each website name followed by "physical activity" was typed into the Google search engine (e.g. "Center for Disease Control physical activity"). The first link was then accessed leading to a potential main PA related webpage for that specific website. This process was also conducted for the website name followed by "exercise" (E.g., Center for Disease Control exercise") and the website name followed by "fitness" (E.g., Center for Disease Control fitness). The term "physical activity" elicited the most relevant main webpage for the public health websites, whereas the terms "exercise" and "fitness" offered the most relevant main webpage for the physical activity organization websites. A main webpage was considered relevant if: (1) there was a health communication as identified by the NIH about physical activity; (2) images were present; and (3) there were subsequent links to more specific or varying information related to physical activity. Each website had a main physical activity related webpage that met these criteria to serve as the main level of observation. These main webpages included simple URLs such as "cdc.org/phyisicalactivity" or "livestrong.com/fitness). Links featured on these main pages were also accessed using the following criteria. If there were only a few images present on each webpage, then all of the included links that lead to subsequent webpages were accessed and all images were included in the final dataset. If the main webpage included more than 50 photos, then just this level of observation as used, but if more webpages were needed but including them all would exceed the 50 images, then a random number generator was used to access up to 5 links from the main webpage. These subsequent webpages that were accessed via links from the main level webpage are considered to be level two.

All images on each webpage were evaluated against the following selection criteria: (1) if you could discern the individual bodyweight status ; (2) if the figure in the image was portraying a human (3) if the image was on a webpage that has physical activity health communications, even if the photo itself was in the context of selling workout clothes or other types of communications related to physical activity (4) if the individual in the image was perceived to be an adult of 18 years or older- this was assessed either by context clues of text or webpage, or by visual perceptions of the image. We aimed to collect up to 50 images from each main website in total. In instances where after the main webpage and level two images were included and 50 images were still not gathered, the random number generator was utilized to access additional links on the level two webpages one by one until 50 images were selected, creating a level three observation for some of the websites. Once identifying which webpages and how many levels were needed to gather 50 photos from a main website, each eligible webpage was screen-captured, with all images on the webpage clearly visible. The trained RA and the

primary investigator went through the screenshots and agreed upon eligibility on images for coding. For the screen-captures in which there were multiple images, the image being coded was identified via labeling and the naming process. For example the files were named *image#.website.webpage.pagetitle.individual.dateretrieved*. This labeling process allowed for researchers to be able to identify both the file and the exact image within each file for coding and data purposes. We also followed a left-to-right process of coding individuals in images and circled and labeled the individuals eligible for coding in circumstances where it could be perceived as unclear. These screen-capture files with the alphabetically labeled images, organized by website and then webpage, make up the included final dataset.