The Relationship Between Perceived Weight Status and Behavioral Practices

By

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ABSTRACT

Studies have emphasized the commonality of individuals being overweight and obese in the US, increasing their chances of risk factors for other diseases. PURPOSE: The purpose of this study is to investigate the relationship among actual weight status, perceived weight status, and weight loss behaviors. METHODS: Sixty-four volunteers, 20-64 years old, participated in this study. The participants submitted their demographic information and completed a questionnaire about their behavioral habits. The volunteers' weight statuses were categorized by the body mass index (BMI) by underweight (1 participant), normal weight (14 participants), and overweight (49 participants). The experiment utilized a binomial regression test to compare actual weight status and perceived weight status, followed by a nonparametric binomial analysis to compare the overweight and normal weight groups. A multinomial logistic regression analysis was used to compare perceived weight status to the weight loss behaviors. Then, a Pearson correlation coefficient analysis was used to compare both groups again. RESULTS: The binomial regression test indicated significance among the participant's ability perceive their weight correctly ($p < .05$). The nonparametric binomial test exemplified that overweight perceivers are correct in their perception ($p < .05$), but 46% of normal weight perceivers are incorrect. A multinomial logistic regression analysis indicates significance among the relationship between a person's perceived weight status and their diet attempts ($p < .05$), strength training attempts ($p < .05$), and current weight loss status ($p < .05$). DISCUSSION: The study population was able to correctly identify their weight status and correctly corresponded it to their weight loss status (gain, lose, or maintain weight). However, the people that perceived their weight as normal were only correct 54% of the time, and 97% of overweight perceivers were correct. Diets and strength training significance could suggest that the population believes these are the best methods for weight loss. This result may imply that diet is seen as a caloric deficit and that strength training is used to tone the body. Fruits and vegetables consumption, cholesterol intake, sodium intake, and aerobic training were not significant. Therefore, people are most likely attempting to change their body image rather than improve their health. This could be due to a potential lack of access to resources, such as proper education on exercise and nutrition, emphasizing the need for education on weight management in public health.

Chapter 1: Introduction

Being overweight and obese is a widespread issue among developing countries. As of 2018, 42.4% of the US population was obese, 11.9% more than in 2000 (CDC, 2020). Each year, there is a minimum of 2.8 million people dying as a result of being overweight or obese (WHO, 2017). Being overweight and obese are known risk factors for many chronic diseases (type 2 diabetes, coronary heart disease, stroke, hypertension, cancers) (Pi-Sunyer, 2010). As a result, overweight status and obesity remain a top public health initiative.

Multiple studies emphasize the commonality of misperceptions of weight status. Pencina, D'Agostino, Fox, Vasan, and Kannel (2018) measured BMI, age, sex, systolic blood pressure and treatment, total and HDL cholesterol, smoking habits, and glucose level with the Framingham Risk Score. When patients' BMI status was compared to long-term risks of cardiovascular disease (CVD) and non-CVD mortality, elevated risk factors were associated with relative weight and abdominal obesity, emphasizing the need for people to understand their weight status and behavioral habits affecting it.

The results of Rasheed's study (1998) exemplify that approximately 60% of women misinterpret their body weight. In addition, Blokstra, Burns, and Seidell (1999) calculated 53% of males and 39% of females in their research were overweight or obese, but 56% of males and 52% of females that were obese believed they were in a healthy weight category. In 2012, Brener, et al. found that 47.4% of students were overweight or at risk to be. However, within this student population, 34.8% perceived themselves as underweight, 42.9% as a normal weight, and 22.3% as overweight. These misperceptions may impact the desire to change physical activity and nutritional behaviors, negatively affecting the population's risk for chronic disease.

Therefore, the purpose of this study is to 1) identify misinterpretations of weight status and 2) analyze how misperceptions of weight status affect diet and exercise habits.

Chapter 2: Review of literature

Misperceptions of Weight Status and Associated Behaviors

It has been well documented that misperceptions of weight status (a disconnect between actual and perceived weight status) among overweight and obese individuals often leads them to associate with a healthier weight status (Burke, Heiland, & Nadler, 2010; Johnson-Taylor, Fisher, Hubbard, Starke-Reed, & Eggers, 2008; Chang & Christakis, 2003; Kuchler & Variyam, 2003). It is hypothesized that misperceptions like these may impact one's desire or perceived need to change physical activity and nutritional behaviors. In 1999, Blokstra, Burns, and Seidell conducted a study in which 53% of the male participants and 39% of the female participants, 20-65 years old, were overweight or obese. However, 56% of the males and 52% of the females perceived their weight to be in the healthy weight category. Physical activity, determined by if the participant was taking part in sport-like activities or not, was not a common strategy used for weight control among this sample. In a similar study, Malinauskas, Raedeke, Aeby, and Smith (2006), found that 80% of participants had tried exercising to lose weight. However, only 19% of the 80% exercised at the level to achieve weight loss. Consistent with previous studies, Brener and colleagues (2012) found more than 20% of students, grades 9-12, were at risk to be or were overweight, yet they perceived themselves as underweight. Because they perceived themselves as underweight, they were unlikely to practice weight loss methods due to being unaware.

Similarly, Rahman and Berenson (2011) assessed the perceptions of body weight and weight-related behaviors in women 18-25 years old. Results indicate that women misperceived

their weight status. Leading the authors to emphasizing the importance for clinicians to address healthy weight maintenance habits to all patients due to these results. Hwang, Ryu, and Park (2015) examined a Korean population for the relationship between misperceptions of weight status and behavior by gender. They found that regardless of weight perception, male subjects tended to increase their behavioral control (such as not smoking or weight management) with increasing risks of comorbidities. Female participants did not change behavior with the increase of comorbidities, however 62% of females were willing to change their behaviors to enhance their appearance. Thus, a significant interaction between comorbidities and weight perception occurred in females ($p = .031$). This may explain why a higher portion of Korean women die from circulatory diseases. If they perceive themselves as healthy via their weight status, they are not as motivated to engage in behavior changes.

In a study conducted by Malinauskas et. al. (2006), 185 female college students, 18-24 years old participated in a survey and had their height, weight, waist and hip circumferences, and skinfold thicknesses measured. Weight classifications were made via their BMI. The Pearson's X^2 and one-way analysis of variance (ANOVA) statistic was used. All weight groups perceived an "attractive weight" as less than their current weight. A majority of the participants (83%) had dieted and ate too little, including skipping breakfast (32%). Eighty percent of participants had tried exercising to lose weight. However, only 19% of the 80% exercise at the level to achieve weight loss. Therefore, this population was not combining weight loss techniques. In addition, a significant amount of people in the study had incorrect perceptions of weight status when compared to their BMI ($p < .05$). Similarly, Ahn and Park (2009) found female college students had significantly inappropriate body images; and irregular sleep ($p< .05$) and eating speed ($p<$

.05) were contributing factors. These factors combined may be causing harmful changes to the students' bodies and their weight status beliefs.

Rasheed (1998) conducted research on body weight and ideal body images in comparison to the participant's exercise and nutrition habits. Participants consisted of obese and non-obese women in Saudi Arabia. The obese group was more likely to emotionally eat and engage in binge eating ($p < .05$). They also were unaware of their increased snacking habits and chose sweet foods over savory, and 75% of the study population was not exercising regularly. Just under 60% of women had misperceptions of their actual body weight, with 28.6% overestimating and 28.9% underestimating their body weight ($p < .05$). Rasheed's conclusion states that preventing and controlling obesity and its behaviors comes with education on eating and exercise.

Brener, et. al. (2012) assessed the relationship between weight perception and BMI in adolescents. The assessment was completed through a 12-question survey that included their self-reported height and weight. The students' heights and weights were also measured via a standard protocol. This study calculated that 47.4% of the students were overweight or at risk to be overweight. In addition, over 20% of students that were at risk or were overweight perceived themselves as underweight. Increasing education on weight control practices and the definition of obesity may alleviate this issue and lead to improved eating and physical activity habits.

Weight Status and Chronic Disease

In 2018, Pencina and colleagues compared patients' BMI status to their long-term risks of cardiovascular disease (CVD) and non-CVD mortality. To measure their long-term risks in comparison to their BMI, the subjects' sex, age, systolic blood pressure and treatment, total and

HDL cholesterol, smoking habits, and blood glucose levels were evaluated through the Framingham Risk Score. A regression analysis was used to examine participants' disease risk in comparison to their weight perceptions. The data suggests that elevated risk factors are associated with relative weight and abdominal obesity. Relative weight and central obesity are also related to a higher frequency of CVD and increased rates of mortality (Pencina et al, 2018).

Darlow and colleagues (2012) believe health literacy may play a role in some misperceptions. Their results indicated that individuals with lower health literacy were able to identify their risk for heart disease, but not for diabetes. In addition, patients with higher health literacy were able to identify their risk for diabetes (Darlow, Goodman, Stafford, Lachance, & Kaphingst 2012). The authors state that the reasoning is unclear, but their inference is that people with higher health literacy may educate themselves more on multiple risk factors for heart disease, causing them to potentially engage in weight-loss behaviors to a greater extent. It is recommended to enhance literacy through education and discuss healthy and effective weight management approaches and ideal body weight, especially among women (Malinauskas et al., 2006; Ahn & Park, 2009; Rasheed, 1998). Ehrman et al. (2018) stated that increasing awareness, for those unaware of the relationship between weight and medical conditions, is an effective way to help patients address their weight status properly. Regular assessments for risk levels and an emphasis on physical activity for treatment and prevention for obesity should be implemented (Blokstra, Burns, & Seidell 1999).

Thus, overweight or obese individuals that view themselves in a healthy weight category may not engage in physical activity or may be less likely to try to eat healthfully. Since many chronic diseases have obesity and overweight status as a risk factor, maintenance of a normal body weight is essential in preventing and reducing these chronic diseases. If individuals are

unaware of their weight status, they may be not engaging in changes to their physical and nutritional health when it's needed. Therefore, the purpose of this study is to 1) identify misperceptions of weight status and 2) analyze how misperceptions of weight status affect diet and exercise habits.

Chapter 3: Methods

Subjects

The study consisted of 64 participants, 13 male and 51 female volunteer participants (without compensation), aged 20-64 years old. Participants were excluded if they were pregnant, undergoing cancer treatment, or were hypertensive or diabetic (Blokstra, Burns, and Seidell, 1999).

Procedures

All participants signed the informed consent form (Appendix A) voluntarily before proceeding. Due to a global pandemic, participants needed to be willing and able to complete a questionnaire (Appendix B) electronically with access to the internet. The questionnaire was based off of Blokstra, Burns, and Seidell (1999) and was administered via Google Forms. There were additional questions to gain more specific information on the participants' habits. Participants received instructions on how to take their height and weight measurements to provide such information. The stadiometry measurements were consistent with Riebe, Ehrman, Liqouri, and Magal (2018). The participants completed the survey questions to the best of their ability. Upon retrieving participants' responses, BMI calculations were completed based on the provided height and weight data. The Institutional Review Board approved this study and its procedures as exempt.

Groups were created based on the participants' BMI category: underweight (<18.5 kg/m^2), normal (18.5-24.9 kg/m^2), and overweight/obese (>25 kg/m^2) (Riebe, Ehrman, Liguori, and Magal, 2018). A binomial regression test was performed between the participant's perceived BMI category and their actual BMI category. A nonparametric binomial analysis was utilized to further analyze which weight group perceived their weight correctly. A multinomial logistic regression analysis was performed among all variables within each weight category. The effects of perceived weight category on the following were explored: number of attempted weight loss diets, fruit and vegetable intake, efforts to reduce cholesterol and sodium intake, efforts to improve aerobic and strength training, and current weight loss status with desired weight loss. A binomial regression comparison of participants' weight category through BMI measurements versus their perceived weight (underweight, just right, overweight) was also evaluated. Pearson's correlation coefficients were generated for normal weight and overweight/obese participants to determine relationships between variables of interest. For this study, *p*-values were determined and compared to an alpha level of .05. Summary data and results were offered to participants if requested after results and conclusions had been made.

Chapter 4: Results

Table 1.

Descriptive Characteristics
(*N* = 64)

Variable	*n*	Minimum	Maximum	Average
Sex				
Male	13			
Female	51			
Age (years)		20.0	64.0	37.0
Weight (lbs.)		102.0	299.0	187.6
Actual BMI		17.5	48.5	30.9
Actual weight categories				
Overweight	49			
Normal weight	14			
Underweight	1			
Perceived weight categories				
Overweight	39			
Normal weight	24			
Underweight	1			

Table 2.

BMI Perceptions
(*N* = 64)

Perception	*n*	Observed Proportion	Tested Proportion	Significance
Correct	52	0.81	0.5	<.001
Incorrect	12	0.19		

*Significance at $\alpha < .05$

Table 3.

BMI among Overweight and Normal Weight Perceivers
(*N* = 63)

	Overweight (*n*)	Normal Weight (*n*)	Significance
Perceived self as overweight	38	1	<.001
Perceived self as normal weight	11	13	.839

*Significance at $\alpha < .05$

Descriptive statistics are shown in Table 1. The binomial regression test (Table 2) utilized for the comparison among participant's identifying their weight status correctly was significant ($p < .05$), indicating participants are able to correctly perceive their weight status.

To further analyze which weight group perceived their weight correctly, a nonparametric binomial analysis (Table 3) was performed. The underweight group was removed from this test due only one subject in this category. The nonparametric test exemplified that 97% of the overweight population correctly perceived their weight status, while the normal weight perceivers were correct 54% percent of the time. This means that 11 out of 24 normal weight perceivers were actually overweight.

Table 4.

Relationships Among Perceived Weight Status and Behaviors (*N* = 64)

Variable	df	Significance
Intercept (Perceived weight status)	0	
Diet attempts	6	0.000*
Fruit/vegetables consumption	6	0.313
Cholesterol intake	6	0.061
Sodium intake	6	0.933
Aerobic fitness attempts	6	0.493
Strength training attempts	6	0.007*
Weight loss status	4	0.000*

*Significance at $\alpha < .05$

A multinomial logistic regression analysis (Table 4) was used among all other variables compared to participant's perceived weight status. Results indicate significance among the relationship between perceived weight status and the following: their number of diet attempts ($p < .05$), strength training attempts ($p < .05$), and current weight loss status ($p < .05$).

Table 5.

Relationship Among Normal Weight Perceivers and Behaviors (*N* = 24)

	Diet Attempts	Fruit/Vegetable Consumption	Cholesterol Intake	Sodium Intake	Aerobic Fitness Attempts	Strength Training Attempts	Weight Loss Status
Actual BMI	.137	.786	.599	.152	.881	.239	.439
Desired BMI	.815	.460	.669	.152	.531	.460	.561

*Significance at $\alpha < .05$

Table 6.

Relationship Among Overweight Perceivers and Behaviors (*N* = 39)

	Diet Attempts	Fruit/Vegetable Consumption	Cholesterol Intake	Sodium Intake	Aerobic Fitness Attempts	Strength Training Attempts	Weight Loss Status
Actual BMI	.328	.313	.059	.109	.379	.202	.381
Desired BMI	.521	.369	.266	.247	.723	.724	.521

*Significance at $\alpha < .05$

To determine which weight status groups were contributing to significant health behaviors, Pearson's correlation coefficients were utilized within each weight group. The underweight group was removed, as there was only one subject. The normal weight perceivers had a trend in the dieting attempts ($p = 0.137$) and sodium reduction attempts ($p = 0.152$) when they considered their actual weight for behavioral changes (Table 5). The overweight perceivers had a behavioral trend (Table 6) in the following categories when referring to their actual weight: cholesterol ($p = 0.059$), sodium reduction attempts ($p = 0.109$), and strength training attempts ($p = 0.202$). These trends provide information for further research with more participants.

Chapter 5: Discussion

While the findings of the current study indicated the overweight participants were able to correctly identify their weight status, but only 54% of normal weight perceivers were correctly understanding their weight. These misperceptions align with Rasheed et al. (1998), who found

participants had misperceptions with regard to weight status, as several women thought of themselves to be overweight when they were a normal weight and vice versa. Additionally, Blokstra and colleagues (1999), with a similar age range of participants, found multiple participants to also misperceive their weight. The majority of their participants (43.2%) had a low educational level which may have contributed to their misperceptions. According to Darlow et al. (2012), higher literacy can lead to a greater understanding of one's condition and how it may lead to chronic disease. Based on the recruitment used in the current study, there is a high likelihood that these participants had either completed or were working towards a college degree, and in turn, may have had an elevated literacy level.

The current study found that diet and strength training were the only significant behaviors in relation to weight statuses (underweight, just right, or overweight). This is contrary to Blokstra, Burns, and Seidell (1999), who found that physical activity was not a common strategy for weight loss. This result may be due to looking at physical activity as both aerobic and strength training, rather than separate practices. The current study's results may indicate that the population believes diet or strength training are the most effective or most common thought for solutions to weight changes. However, fruit and vegetable consumption, cholesterol intake, and sodium intake were not significant. This could imply that diet is emphasized as a caloric deficit rather than changing the types of foods someone eats to enhance health. Similar to the findings in the Malinauskas et al. study (2006), the current study found aerobic training attempts were not indicated as a weight management technique that participants were using. Results could stem from an idea that strength training means a toned body and that people are likely attempting to change their body image rather than improve their health. Additionally, during the COVID-19 pandemic with fitness facilities closed and access to coaching being limited, it is likely that

individuals sought out health and fitness information through online sources. According to Yang, Maher, and Conroy (2015), these media sources are inadequate levels of education and feedback for behavioral change. This could mean that people are trying to learn how to better their health but not receiving the information in the best format.

Results may demonstrate that regardless of acknowledging weight status and if an increase or decrease in weight should occur, behavioral modifications pertaining to weight loss, maintenance, or gain are difficult for many. Additionally, this study may suggest multiple explanations for populations being overweight or obese. This may be a result of the lack of access to resources or education, as 45% of the participants that labeled themselves as a normal weight were actually overweight. This emphasizes the need for education on the fundamental causes of weight gain, how to recognize weight increases, and strategies on maintaining weight to prevent chronic disease. Education on understanding weight and its management may be improved via a change in public policy, an added unit in primary education classes, and emphasizing such education in patient care.

LIMITATIONS

The global pandemic caused multiple limitations. Limitations during this study include the inability to meet in-person for a skinfold analysis instead of a BMI calculation. Skinfold analysis would have allowed for a more accurate categorization of overweight status, eliminating or reducing the potential of a participant being labeled overweight when they have a low body-fat percentage and higher muscle mass. In addition, during the pandemic many fitness facilities were closed and therefore participants did not have access to equipment or professionals that could help promote appropriate behavior change practices.

Additionally, this study did not examine misperceptions by age because when assigning groups based off of the decades participants were born in, only the 1970's and 1990's had greater than five participants. Therefore, there are not enough data for the following age groups to be assessed: 1950's, 1960's, 1980's, and 2000's. However, generally speaking, the studies seemed to find more misperceptions with younger individuals thus it seems this may be something to further examine. Finally, a longitudinal study may assist in following behaviors more precisely as well highlighting the consistency of behaviors, their connection to perception and their potential impact on health.

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Appendix A

Informed Consent

UNIVERSITY OF WISCONSIN River Falls
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Informed Consent for Research Participation

IRB #: *Exempt* **IRB Approval Date: November 10, 2020**

Study Title:

Researcher Names	Department	Contact Information
1. Vanessa Case (Student Co-PI) 2. Jodee Schaben (Faculty Co-PI)	EXSS EXSS	vanessa.case@my.uwrf.edu jodee.schaben@uwrf.edu

We are asking you to participate in our research study. Participation is voluntary and you may stop at any time, including skipping any questions you do not want to answer for any reason. If you choose not to participate or stop participating, or skip any questions, there will be no negative consequences to you. Participating will not change anything about your relationship with the researchers or our Departments. Participating or not participating will not change any services you receive from UWRF services.

Overview of the Research

Purpose of the Study	The purpose of this study is to explore the relationship between perceived weight status and behavioral practices.
What you will be asked to do	Through written instruction, you will be asked to measure your height and weight. In addition, there will be close-ended questions on a survey for you to answer.
Amount of time it will take you to participate	10-15 minutes.
Risks to you if you choose to participate	There is no risk due to no way to identify the participant's submission. Everything is anonymous.
What we will do to reduce the risks	N/A
Benefits to you or others if you choose to participate	Providing information will help us explore the relationship between health and behavior and help us guide rehabilitation practices better.
Compensation offered to you for participating	None.

Confidentiality and Data Protection

Who will see my answers/information?	Vanessa Case and Jodee Schaben (Co-Principal Investigators)

Where will my answers/ information be stored?	The data will be downloaded onto a flash drive and kept in a safe with a code.
How will my answers /information be protected?	The questionnaire will be deleted from online resources and stored on a secured flash drive.

Protection of Human Research Subjects

If I have questions about this research I should contact:	Vanessa Case
If I have questions or want to complain about my rights or how I was treated as a research participant I should contact:	Institutional Review Board Chair University of Wisconsin River Falls 410 S. Third St. River Falls, WI 54022 715-425-0629 irb@uwrf.edu

Please choose yes or no if you agree to participate in this survey. If you choose "Yes" you will be taken to the survey. If you choose "No", you will exit out of this survey. You may skip any question you do not want to answer by choosing "Prefer not to answer." If you want to stop answering questions, please just close your web browser.

Appendix B

Questionnaire

This study was in the format of a Google Form for better accessibility due to COVID-19.

Please choose yes or no if you agree to participate in this survey. If you choose "Yes" you will be taken to the survey. If you choose "No", you will exit out of this survey. You may skip any question you do not want to answer by choosing "Prefer not to answer." If you want to stop answering questions, please just close your web browser.

Yes, I would like to participate. No, I will not participate.

What is your sex? Biological male Biological female Prefer not to say

What year were you born in? _____

How would you describe your weight status? Choose one of the following options:

Overweight Underweight Just right Prefer not to say

*What is your measured body weight in pounds? Round to the nearest pound (.0 - .49 = round down; .50 - .99 = round up) _____ Prefer not to say

*Note: Perform weight measurement on an electronic scale with minimal clothing, empty pockets, and no shoes (Riebe, Ehrman, Ligouri, and Magal, 2018) or use the measurements from your most recent doctor's visit.

How many pounds do you want to lose, if any? If none, type "0." _____

**How tall are you in inches? _____ Prefer not to say

**Note: Perform height measurement by removing shoes and using stadiometer (Riebe, Ehrman, Ligouri, and Magal, 2018) or use the measurements from your most recent doctor's visit.

How many times have you attempted a weight loss diet over the last year? Choose one of the following options:

Never 1-2 times 3-5 times > or = 6 times Prefer not to say

How many times have you attempted to improve your fruit and vegetable intake over the last year? Choose one of the following options:

Never 1-2 times 3-5 times > or = 6 times Prefer not to say

How many times have you attempted to reduce your cholesterol intake over the last year? Choose one of the following options:

Never 1-2 times 3-5 times > or = 6 times Prefer not to say

How many times have you attempted to reduce your sodium intake over the last year? Choose one of the following options:

Never 1-2 times 3-5 times > or = 6 times Prefer not to say

How many times have you attempted to improve your aerobic training over the last year? Choose one of the following options:

Never 1-2 times 3-5 times > or = 6 times Prefer not to say

How many times have you attempted to improve your strength training over the last year? Choose one of the following options:

Never 1-2 times 3-5 times > or = 6 times Prefer not to say

What is your current weight loss status?

Trying to lose weight Trying to gain weight Trying to maintain weight

Prefer not to say