

WEIGHT PERCEPTION AND WEIGHT LOSS BEHAVIORS; A COMPARISON
BETWEEN ADOLESCENTS WITH AND WITHOUT AUTISM SPECTRUM
DISORDER

By

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A Thesis Presented to

The Faculty of Humboldt State University

In Partial Fulfillment of the Requirements for the Degree

Master of Science in Kinesiology: Teaching/Coaching

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ABSTRACT

OBJECTIVE: The primary purpose of this study is to investigate the accuracy of weight status perception among adolescents with and without Autism Spectrum Disorder. A secondary purpose is to compare weight loss behaviors between children with and without ASD.

METHODS: This study measured weight-perception and weight loss behaviors among Irish-thirteen-year olds with ASD (n=47) and typically developing (TD) children (n=47) (72% male). Participants completed questionnaires assessing perception of weight and weight loss behaviors. . Based on BMI, calculated from height and weight measurements, participants were classified as non-overweight, overweight and obese. Several Chi-square tests were used to examine (1) differences in accuracy of self-perception between adolescents with and without ASD, and (2) weight loss behaviors among children with and without ASD.

RESULTS: All results from this study were statistically non-significant. Although, the study demonstrated that overweight adolescents with ASD were more than twice as likely (35%) to perceive their weight inaccurately compared to their overweight TD counterparts (15.4%). **CONCLUSION:** Future research should investigate self-perception in adolescents with ASD and the effects their body image has on their weight loss behaviors, social motivation, physical activity levels, and psychological health.

Keywords: Autism Spectrum Disorder, Typically Developing, Weight loss behaviors, weight perception

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INTRODUCTION

Obesity is a health condition characterized by the excessive accumulation and storage of body fat (Olson, Aldrich, Callahan, Matthews, & Gance-Cleveland, 2015). Childhood obesity has reached epidemic levels in developed countries and is a major focus of public health efforts worldwide, especially in the United States (Dehghan, Akhtar-Danesh, & Merchant, 2013). According to the Center for Disease Control and Prevention, Childhood Obesity affects approximately 12.5 million American children and teens, or 17% of the population (Centers for Disease Control and Prevention (CDC), 2011). Approximately 20% of American adolescents (12-19) are living with obesity and 17.4% of children (6-11). About 70% of obese adolescents grow up to become obese adults (Dehghan, Akhtar-Danesh, & Merchant, 2013) The occurrence of obesity among American adults is 34% – twice the percentage observed in children – and translates into 73 million obese adult men and women (Flegal, K.M, Carroll, M.D, Kit, B.K, & Ogden, C.L, 2012). The global estimates from the World Health Organization (WHO) in 2008 shows that 1.5 billion adults (20 years or older) were overweight, and of these over 200 million men and approximately 300 million women were obese worldwide. Within the WHO European Region, over 50% of both men and women were overweight, and roughly 23% of women and 20% of men were obese (Kearns, Dee, Fitzgerald, Doherty, Perry, 2014).

Research demonstrates that the increasing rate of overweight and obese children has detrimental social, economic, and health consequences (Hu, 2008). Being overweight or

obese puts both children and adults at risk for both short-term and long-term health consequences (Flegal, K.M, Carroll, M.D, Kit, B.K, & Ogden, C.L, 2012). Since increasing body fat is associated with increasing morbidity, being overweight and obese is largely linked to various health risks. Obesity is a disease that negatively affects the psychological and physiological well-being of a person, especially children and adolescents. Physiological factors include: Type 2 diabetes, metabolic syndrome, hyperandrogenism, heart disease, hypertension, asthma/other respiratory factors, sleep disorders, fatty liver disease, gall bladder disease, and orthopedic impairments (“CONSENSUS STATEMENT: Childhood Obesity”, 2005). Seventy percent of children living with obesity have at least one additional cardiovascular risk factor, and 30 % have two or more (Bazzano, et al., 2011). A recent report estimated that 15% of new diabetes cases among children and adolescents are type 2 diabetes; in the 1980s, type 2 diabetes in teens was virtually unheard of (“The Burden of Diabetes Mellitus Among US Youth: Prevalence Estimates From the SEARCH for Diabetes in Youth Study”. (2006)).

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Children with Autism Spectrum Disorder (ASD) in the United States are particularly at risk of becoming obese (Corvey, Menear, Preskitt, GoldFarb, & Menachemi, 2016)). Adolescents diagnosed with ASD were twice as likely to be obese when compared to adolescents who are typically developing (Phillips, et al., 2014). Furthermore, recent research demonstrates children with ASD have higher prevalence rates of obesity (31.8%) than children with other developmental disabilities (20.4%) (Phillips, et al. 2014). The literature documents that children and adolescents with Autism

Spectrum Disorder are more likely to be obese due to less engagement in physical activity and more involvement in sedentary behaviors (Corvey, Menear, Preskitt, GoldFarb, & Menachemi, 2016)). Sedentary behaviors are more frequent among children with ASD possibly due to sensory challenges, social skill impairments, co morbidities, and the increased likelihood of medication use that leads to weight gain (Corvey, Menear, Preskitt, GoldFarb, & Menachemi, 2016)).

Current research demonstrates the importance of body image perception to understanding adolescent weight control behaviors (Liechty, 2010). Studies report that girls with an average BMI perceive their weight status more accurately than boys with an average BMI and overweight and obese girls underestimate their body size more than overweight and obese boys (Maximova, Khan, Austin, Kirk, Veugelers, 2015)). The ability to recognize one's weight status as obese may be a necessary step in addressing adolescent obesity, as weight perception may be an important predictor of weight control behaviors (Chung, Perrin, Skinner, 2013). Identifying one's weight status as overweight has been shown to encourage both healthy and unhealthy weight control behaviors, in TD adolescents with a healthy weight status as well as those with a overweight/obese weight status. TD adolescent girls are more likely to overestimate their weight, and that overweight/obese TD adolescent boys are less accurate in weight perception than overweight/obese girls. Self-perception of overweight and obesity, whether correctly identified or not, is associated with weight loss behaviors in both TD adolescent boys and girls. The prevalence of weight loss efforts increases 20% to 30% when adolescents identify their weight status as overweight/obese. (Chung, Perrin, Skinner, 2013).

Inability to accurately perceive one's weight status may lead to unhealthy weight loss behaviors. For example, body size misconceptions may also be linked to unhealthy weight loss behaviors and include the following behaviors: meal skipping, excessive dietary restrictions, use of laxatives, diet pills, self-induced vomiting, and binge eating (Edwards, Pettingell, Borowsky, 2010)). These weight loss behaviors are common among people with poor body image, or body dissatisfaction; sometimes due to inaccurately perceiving oneself as overweight or obese. Therefore, an inaccurate perception of one's weight may potentially lead to two unhealthy outcomes; (1) it may lead to a lack of understanding, of one's body weight and health status, thus not serving as a motivator for healthy behaviors, or (2) can lead to a body distortion and enhance the prevalence of unhealthy weight loss behaviors.

No research has been conducted on self-perception and self-understanding in children with ASD. Due to the nature of the diagnoses and the unique personality traits of children/adolescents with ASD, we hypothesize that they people with ASD may have an impaired judgment of perceived weight status when compared to their typically developing (TD) peers. Children with ASD experience debilitating interpersonal impairments due to a neurocognitive differences in the basic motivation and ability to understand other people's feelings, thoughts, and behaviors- perhaps even their own (Baren-Cohen, 2009). The interpersonal challenges towards others and self for children diagnosed with ASD could lead to misinterpretations of body perception and cause a lack of understanding of the need for personal weight management behaviors (e.g. health nutrition, exercising, etc). Individuals with ASD our often characterized as having poor

self-understanding which can potentially lead to inaccurate self-perception. According to the theory of mind, people with Autism Spectrum Disorder are unable to understand that other people have their own thoughts, point of view, personal plans, beliefs, attitudes, and emotions (Chris Frith & Uta Frith, 2017). Children with Autism Spectrum disorder's lack of ability to understand others perspectives and reluctances to engage in social interaction affects their ability to attain accurate self-knowledge. A major factor in developing self-knowledge depends on one's ability to understand another's attitude towards oneself and is mediated by reading another's reactions to oneself during social interactions. Children with ASD have difficulties understanding appropriate social interactions and have a tendency to withdraw from social situation which may cause them to be lower in extraversion than their typically developing peers (Schriber, R. A., Robins, R. W., & Solomon, M. (2015, June 19).

Due to the unique social characteristics and challenges experienced among the ASD population, outlined above, people with ASD may have an impaired judgment of perceived weight status when compared to their typically developing (TD) peers. The primary purpose of this study is to investigate the accuracy of weight status perception among adolescents with and without Autism Spectrum Disorder. A secondary purpose is to compare weight loss behaviors between children with and without ASD.

METHODOLOGY

Participants

The second wave of the Growing Up in Ireland (GUI) data set provided nationally representative data on physical, behavioral, psychological, environmental, and cognitive outcomes for 13-year olds living Ireland. A systematic stratified sampling procedure was used to recruit 8570 participants from 910 schools across Ireland. Data was collected for approximately one year from September 2007 to June 2008. Questionnaires regarding children's characteristics, experiences, and development were completed on a number of outcomes by each parent and child participating in the study. Information on the child's social, emotional, cognitive development and school characteristics were reported by the students' teachers and principals. The Research Boards' Research Ethics Committee granted ethical approval. Response rates at the family level were 57%; 82% at the school level. For more information regarding the data set see Murray et al. (2011).

This study included 94 participants (n=132): forty-seven adolescents with ASD and forty-seven typically developing children randomly selected for comparison purposes. The Children in the "ASD group" qualified only if their primary guardian reported an ASD diagnoses by a medical professional. The Health Service Executive (2012) outlines specific professionals who may provide diagnoses and include the following: psychologists, psychiatrists, community pediatricians, speech and language therapists, clinical nurse specialists, and social workers.

Measures

Body mass index is the most popular method for assessing body fat percentage in children. To measure actual weight status for each child, the interviewer took the weight and height of each child participant to derive a body mass index score. Height was measured to the nearest millimeter using a Leicester portable height measure. Weight was measured to the nearest kilogram, using a class IV, medically approved scales (SECA 761). Body mass index was calculated using weight in kilograms divided by height in meters squared. Body mass index classifications were standardized on chronological age and sex of each individual, as provided by the international Obesity Task Force (IOTF) (Cole et al.2000), and were used to classify children as non-overweight, overweight and obese.

There were multiple self-reported measures included in the analysis to measure perceived weight status and weight loss behaviors. To measure perceived weight status the following question was asked, “How would you describe yourself”? Both the ASD and TD group could choose from five answers: very skinny, a bit skinny, just the right size, a bit overweight, and very overweight. Four questions were used to analyze weight loss behaviors using categorical responses in children with and without ASD: 1) Have you ever exercised to lose weight or to avoid gaining weight? The question was measured by a yes or no response. 2) Have you ever eaten less food, fewer calories, or foods low in fat to lose weight or to avoid gaining weight? This question was also measured by a yes or no response. 3) How often do you weigh yourself? Answers for the following question included 6 responses: more than once a day, every day, once a week, once a month, less

than once a month, and never. 4) Which of the following are you trying to do about your weight? The participants selected from four options: lose weight, gain weight, stay the same weight, and I am not trying to do anything about my weight. Information gathered from the questions was collected by interviewers trained in data collection techniques, building rapport with the children, and ethical behavior. The Piers Harris 2 self-concept questionnaire was first administered to the adolescents in their school by the GUI interviewer. Post school-based data collection, a GUI interviewer was assigned to each child's home. Prior to the home visit, the interviewer wrote a letter of introduction and made a phone call home to each interviewee's family. Interviewers were administered on a Computer Assisted Personal Device (CAMPE). The interviewer received training emphasizing the importance of establishing a good rapport, the power imbalance that may exist, and strategies to put the child at ease (for example asking them about their favorite activities) when collecting data involving the child (Murray et al.,2011). The interviewer was instructed to explain a question when not understood by the respondent, but not to prompt an answer. Prompt cards were available with the available possible answers for the child-reported questions (Murray et al., 2011).

Statistical Analysis

Descriptive statistics were provided for weight status and weight loss behaviors for both the ASD and TD group. Several Chi squares were conducted to compare: 1) weight status between children with ASD and TD children; and 2) to compare perceived weight and actually weight status among children with and without ASD. . Finally, chi

square analyses were used to compare weight-loss behaviors between adolescents who perceived themselves as being overweight/obese and those who did not.

RESULTS

Demographics

This study included 94 adolescents; 47 adolescents with autism and 47 TD adolescents. Groups were gender matched, with 36 male adolescents in each group (72% male). When comparing socio-economic status between adolescents with ASD and TD adolescents no significant difference was observed ($m=16,369.56$, $SD = 7,493.28$ and $m=16,813.95$, $SD= 8939.63$ respectively) ($p = .375$).

Weight status between groups

Height and weight measures were used to calculate BMI for each participant and scores were used to classify adolescents as non-overweight, overweight, or obese based on the IOTF categories. The average BMI in the group with ASD was 21.52 ($SD = 4.304$) and the average BMI in the TD group was 20.82 ($SD = 3.264$); a difference not deemed to be significantly different ($p=.375$). With regards to IOTF weight status categories, 63.8% ($n=30$) of adolescents with ASD and 72.3 % ($n=34$) of TD adolescents were non-overweight. Over 25% ($n = 12$) of the group with ASD were overweight, in comparison to 23.4% ($n = 11$) of the TD group. Obesity levels were 10.6% ($n=5$) among the group with ASD and 4.3% ($n=2$) in the TD group.

Perceived Weight Status

The ability of the participants of this study to accurately perceive their own weight status, relative to their IOTF category was examined between groups. First perception of weight status among the participants who were non-overweigh was assessed. Among non-

overweight adolescents with ASD, 55.2% (n=16) correctly perceived themselves as being non-overweight, compared to 64.7% (n=22) of non-overweight TD adolescents.

Conversely, 27.6% (n=8) of non-overweight adolescents with ASD perceived themselves as skinny, and 17.2% (n=5) perceived themselves as overweight; compared to 28.6% (n=18) of non-overweight TD adolescents who perceived themselves as skinny and 5.9% (n=2) who perceived themselves as overweight. Differences in accuracy of perceived weight status between groups were found to be non-significant ($p=.355$).

Second, perception of weight status was examined among the adolescents who *were* overweight or obese according to IOTF criteria. Among overweight adolescents with ASD, 64.7% (n = 11) correctly perceived themselves as being overweight; this compared to 84.6% (n= 11) of the TD overweight adolescents who perceived themselves as being overweight. Conversely, some adolescents with ASD who were overweight perceived themselves as being non-overweight (29.4%, n=5), or skinny (5.9%, n = 1); this compared to 15.4% (n=2) of overweight TD adolescents who perceived themselves as being non-overweight. These differences were not, however, deemed to be significant ($p=.410$) (See table 1).

Table 1: Overview of self-perception of weight among non-overweight/overweight adolescents with and without ASD

	Non- overweight ASD (n =29) n(%)	Non- overweight TD (n =34) n(%)	Overweight ASD (n =17) n (%)	Overweight TD (n =13) n(%)
Self-perception of weight:				
Skinny	8(27.6)	10(29.4)	1(5.9)	-
Non- overweight	16(55.2)	22(64.7)	5(29.4)	2(15.4)
Overweight	5(17.2)	2(5.9)	11(64.7)	11(84.6)

Weight loss behaviors

Frequency of weight loss behaviors were examined among adolescents, included examination of four behaviors: (1) 45.5% (n=20) of the group with ASD and 44.7% (n=21) of TD group reported to exercise to lose weight(p=.554); (2) 20.5% (n=9) of the group with ASD and 23.4% (n=11) of the TD group reported dieting to lose weight(p=.466); (3) Regarding frequency of weighing oneself, group with ASD most commonly reported that they never weight themselves (reported by 44.4%, n=20), compared to the TD adolescents who most commonly that reported to weight themselves less than once a month (reported by 42.6 %, n=20)(p=.401); (4) Among adolescents diagnosed with ASD, 34.8% (n=16) indicated that they are trying to lose weight, compared to 29.8% (n=14) of TD adolescents(p=.854). Differences were not deemed to be statistically significant.

Frequency of weight loss behaviors were also examining among overweight or obese adolescents. Among the group with ASD, 66.7% (n=10) reported that they exercise to lose weight, compared to 61.5% (n = 8) of participants in the TD group(p=.483). Regarding diet to lose weight, 31.3 % (n=5) of adolescents with ASD and 38.5%% (n=5) of TD adolescents reported to engage in this behavior (p=.499). The majority of overweight adolescents with ASD (43.8%, n=7) reported that they weigh themselves less than once a month, compared to the majority of TD adolescents (42.6 %, n=13) who reported that they never weigh themselves (p=.109). Finally, relating to intention to lose weight, the majority of adolescents with ASD (64.7%, n=11) and TD adolescents (69.2%,

n=9) indicated that they are trying to lose weight ($p=.785$). See table 1 for an overview of weight loss behaviors between groups.

Table 2: Overview of weight loss behaviors among the full sample and overweight adolescents with and without ASD

	Full sample with ASD (n =44) n(%)	Full sample TD (n =47) n(%)	Overweight ASD (n =15) n(%)	Overweight TD (n =13) n(%)
Exercising to lose weight (yes)	20(45.5)	21(44.7)	10(66.7)	8(61.5)
Dieting to lose weight (yes)	9(20.5)	11(23.4)	5(31.3)	5(38.5)
Weighing oneself:				
More than once a day	1(2.2)	1(2.1)	1(6.3)	-
Once a week	4(8.9)	3(6.4)	2(12.5)	1(7.7)
Once a month	5(11.1)	10(21.3)	1(6.3)	2(15.4)
Less than once a month	15(33.3)	20(42.6)	7(43.8)	4(30.8)
Never	20(44.4)	13(27.7)	5(45.5)	6(46.2)
Intention to lose weight:				
Lose weight	16(34.8)	14(29.8)	11(64.7)	9(69.2)
Gain weight	1(2.2)	2(4.3)	17(56.7)	13(43.3)
Stay the same weight	15(32.6)	14(29.8)	1(5.9)	1(7.7)
Not trying to do anything	14(30.4)	17(36.2)	5(29.4)	3(23.1)

DISCUSSION

The primary purpose of this study was to examine accuracy of weight perception between children with and without ASD in a sample of Irish thirteen-year-old adolescents. This study found that the mean score for body mass index was slightly higher among children in the ASD group when compared to the TD group, although the results weren't statistically significant. The study found that 36.1% (n=17) of the ASD group were overweight or obese – as per the IOTF categories – in comparison to 27.7% (n=13) of the TD group. The findings of the current study closely reflect some previous research on youth with ASD; for example research by Zuckerman, Hill, Guion, Voltolina, and Fombonne examined weight status among Oregon children with ASD, demonstrated prevalence rates of overweight/obesity to be 35.1% among children with ASD (Zuckerman, Hill, Guion, Voltolina, & Fombonne, 2014). This is in contrast to other previous research that found children with ASD were twice as likely to be obese when compared to their TD peers (Phillips, et al., 2014). It is clear that youth with ASD demonstrate a high risk of being overweight or obese (Corvey, Menear, Preskitt, Goldfarb, & Menachemi, 2016). The literature proposes a variety of possible reasons as to why the rate of overweight and obesity is higher among youth with ASD, included attributing cause to less engagement in physical activity, more involvement in sedentary behaviors, and medication use that may lead to weight gain (Corvey, Menear, Preskitt, Goldfarb, & Menachemi, 2016). Future research should seek to continue to investigate the correlates of overweight and obesity among children with ASD.

This was the first study to examine the ability of adolescents with ASD to perceive their weight; an ability that has previously been associated with effective weight management in other populations. Perception of being overweight in TD adolescents has been shown to enhance both healthy and unhealthy weight control behaviors, in adolescents with a healthy weight status as well as an overweight/obese weight status (Chung, Perrin, Skinner, 2013). . Accurate self-perception of being overweight/obese is associated with greater weight loss effort. Self-perception of weight status, whether correctly identified or not, is associated with weight loss behaviors in both TD boys and girls. The prevalence of weight loss efforts increase 20% to 30% when adolescents identify their weight status as being overweight/obese (Chung, Perrin, Skinner, 2013). This study showed that 55.3% (n = 16) of the non-overweight adolescents with ASD perceived themselves correctly, compared to 64.7% (n=22) of non-overweight TD adolescents. Furthermore, among adolescents who were overweight or obese, in the group with ASD, only 64.7% (n=11) accurately assessed their weight status compared to 84.6% of the overweight or obese TD adolescents. This difference in ability that emerged warrants further investigation with larger samples sizes and more precise weight status measures. In addition, if this difference in ability to perceive weight is persistent across other groups with ASD, research should seek to understand *why* adolescents with ASD may not accurately assess their own weight status as compared to their TD counterparts. In the absence of research on the topic, we may hypothesize as to why weight status perception may be altered among the population with ASD based on our understanding of the nature of ASD. One possibility involves theory of mind.

Individuals with ASD have an inability to understand that other people have their own thoughts, points of view, personal plans, beliefs, attitudes, and emotions (Firth, 2005). The lack of ability to understand others' perspectives and their reluctance for social interaction may affect their ability to attain accurate self-knowledge. The lack of self-knowledge among people with ASD when compared to TD people could contribute to the differences between groups related to accurately perceiving their own weight status. Furthermore, theories of health behavior, including the social-cognitive theory of health behavior, recognizes the role of the social environment; self-assessments of health and subsequent health behaviors are shaping by others through vicarious experiences impacting on self-efficacy, and by others acting as models that transmit knowledge and teach skills and strategies for behavior change (Bandura, 1998). Due to the compromised theory of mind among adolescents, the impact of these social influences may be weakened, thus altering self—evaluation and health behaviors. Future research is recommended on this topic and may give insight into adolescents with ASD's self-perception, and health behaviors.

In addition to examining weight perception, the participants' engagement in weight-loss behaviors was also examined, and compared between groups. These behaviors had previously been unexplored for this population. Both groups were revealed to participate in weight-loss behaviors at comparable levels; for example regarding exercising to lose weight, 45.5% (n=20) of the group with ASD and 44.7% (n=21) of the TD group responded yes. In addition, 23.4% (n =11) of the TD sample engaged in this dieting to lost weight similar to TD adolescents (20%, n = 9). Previous research

demonstrates that youth with ASD engage in less physical activity when compared to their TD peers (Healy, Haegele, Grenier, & Garcia, 2017) but this is the first research to examine weight-loss behaviors in youth with ASD. Research illustrates that weight-loss behavior do differ between groups, with prevalence of weight loss behaviors highest among teenage adolescent girls (Liechy, 2010). In the current study there was few girls, thus comparisons with previous research on weight loss behaviors are difficult. Further research on weight loss behaviors among adolescents with ASD, specifically girls, should be examined.

Even though this research is the first to examine accuracy of perceived weight in adolescents with ASD, and has several strengths including a nationally representative sample, some limitations should be acknowledged. First, self-reporting is a subjective measurement and can be sensitive to bias and recall error. Although self-report was required to assess self-perception, it may be particular problematic for the weight-loss behavior questions. Secondly, due to the group with ASD and TD group being gender matched, –and thus reflecting the higher percentage of males with ASD – the numbers of females in this study was low. As previous research has shown weight-loss behavior to be particularly problematic among adolescent girls, further research should seek to involve more females with ASD in research on weigh perception and weight-loss behaviors. . Another limitation was using BMI as a measurement to determine weight status. Although BMI was measured by a trained researcher, BMI has variety of deficiencies as a measure of weight status. BMI is an indirect measure of body fat compared to a more accurate, direct approach, such as bioelectrical impedance. BMI may not reflect the

muscle mass of the individual and generally underestimates weight status. Finally, this study employed a small sample; limiting the ability to detect significant differences between groups. Future research should seek to involve a larger sample.

CONCLUSION

Research is continuing to investigate obesity trends and physical activity levels in children with ASD. This study contributes to the literature by being the first to examine perceived weight status and weight loss behaviors in adolescents with and without ASD. Though results were statistically non-significant; the results demonstrated differences in BMI, perceived weight status, and weight loss behaviors between groups. Members of the group with ASD who were overweight were more than twice as likely to inaccurately perceive their weight status when compared to the TD participants. Future research should investigate self-perception in adolescents with ASD and the effects their body image has on their weight loss behaviors, social motivation, physical activity levels, and psychological health.

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