Preventive Medicine 87 (2016) 47–50

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

Brief Original Report

The association between discrepant weight perceptions and objectively measured physical activity

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ARTICLE INFO

Article history:
Received 14 October 2015
Received in revised form 30 January 2016
Accepted 1 February 2016
Available online 11 February 2016

Keywords:
Accelerometry
Epidemiology
Weight perception

ABSTRACT

Background. Some individuals perceive themselves as being normal weight, despite having an excess body fat percentage (e.g., underestimate weight). Conversely, other individuals perceive themselves as being overweight, despite having a normal body fat percentage (e.g., overestimate weight). When perceived and actual weight statuses are incongruent, individuals possess a discrepant weight perception. The association between discrepant weight perceptions and engagement in moderate-to-vigorous physical activity (MVPA) has not been thoroughly investigated, which was this study's purpose.

Methods. For this cross-sectional study, data from the 2003–2006 National Health and Nutrition Examination Survey were utilized ($N = 5462$ adults). MVPA was assessed via accelerometry. Based on measured body mass index and whether participants considered themselves as overweight, underweight, or about the right weight, we classified individuals as accurate perception, overestimate weight (discrepant), or underestimate weight (discrepant). A negative binomial logistical regression was used to assess the association between discrepant weight perception (independent variable) and engagement in MVPA (outcome variable).

Results. Females who said that they are normal weight, but were in fact overweight based on body mass index, engaged in 13% less MVPA (rate ratio = .87, 95% confidence interval: .769–.999, $P = .05$). Also, older adults (>60 yrs) who said that they are normal weight, but were overweight based on body mass index, engaged in 23% less MVPA (rate ratio = .77, 95% confidence interval: .616–.965, $P = .025$).

Conclusion. Discrepant weight perceptions were associated with less objectively measured MVPA. Interventions should take weight perceptions into consideration when designing and evaluating intervention impact.

1. Introduction

Weight perception has been defined as how an individual perceives his or her body weight, and is affected by their "ideal" and "normative" body images (Park, 2011). Some individuals perceive themselves as being normal weight, despite having an excess body fat percentage (e.g., underestimate weight). Conversely, other individuals perceive themselves as being overweight, despite having a normal body fat percentage (e.g., overestimate weight) (Duncan et al., 2011; Harring et al., 2010). Furthermore, males are more likely to underestimate their weight, in contrast to females who generally overestimate their weight (Kuchler and Variyam, 2003; Yaemsiri et al., 2011; Park, 2011). Discrepant weight perceptions may be problematic in terms of both health behaviors and resulting health outcomes (Loprinzi, 2015; Loprinzi et al., 2015). This is in alignment with various theoretical models, including the Health Belief Model, which posits that beliefs and attitudes play an important role in behavioral initiation and maintenance (Rosenstock, 1974). Studies suggest that the discrepancy not only contributes to the current obesity epidemic (Park, 2011), but individuals who possess a discrepant weight perception are likely to engage in negative health behaviors including: substance use, alcohol abuse, disordered eating, and smoking (Antin and Paschall, 2011; Eichen et al., 2012). They are also at an increased risk of suffering from depression (Harring et al., 2010). This is concerning as these potentially negative consequences of discrepant weight perceptions may influence health-enhancing behaviors, such as physical activity. However, no recent studies to our knowledge, have examined the association between weight perception and engagement in accelerometer-assessed moderate-to-vigorous physical activity (MVPA) using a nationally representative sample.

While even light physical activity is considered beneficial (Loprinzi, 2016a, 2016b), exploring the link between weight perception and MVPA is important given that MVPA is associated with numerous positive health outcomes including: a reduced risk for certain cancers, type 2 diabetes, coronary heart disease, stroke, and metabolic syndrome; improved cognitive function, sleep quality, and bone density; and lower levels of depression (U.S. Department of Health and Human

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http://dx.doi.org/10.1016/j.ypmed.2016.02.004
0091-7435/

Services, 2008). Also, national physical activity objectives for Healthy People 2020 include increasing the proportion of adults who engage in physical activity of at least moderate intensity; weight perceptions are a potential barrier to reaching those objectives (U.S. Department of Health and Human Services, 2016). Consequently, there is a need to investigate whether there is an association between weight perception and engagement in MVPA. Therefore, the primary purpose of this study was to examine the association between weight perception and engagement in MVPA using a nationally representative sample. A secondary objective was to determine if individuals' demographic profiles (race, gender, age, and socioeconomic status) moderate the potential association between weight perception and engagement in MVPA. This is plausible because previous research has demonstrated that weight perception and engagement in MVPA are both associated with the aforementioned demographic variables (Ebben and Brudzynski, 2010; Fountoulakis and Grogan, 2014; Markland and Ingledew, 2007; Martin et al., 2009). We hypothesized that individuals who are overweight, but perceive themselves as normal weight (i.e., underestimate weight) will engage in less MVPA than those who possess an accurate weight perception. Furthermore, we hypothesized that the potential association between weight perceptions and MVPA would vary by race, gender, age, and socioeconomic status.

2. Methods

2.1. Design and participants

The data for this study came from the 2003–2006 National Health and Nutrition Education Survey (NHANES), which is conducted by the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention; these cycles were evaluated because these are the only current publically available cycles with accelerometry data. NHANES is a cross-sectional, nationally representative survey of the noninstitutionalized US civilian population. The NHANES data are publicly released for 2-year survey periods to protect confidentiality and increase statistical reliability (Zipf et al., 2013). The present study included 5462 adults 20 and older; all participants provided written informed consent before data collection. The National Center for Health Statistics ethics committee approved the study.

2.2. Discrepant weight perception

To assess discrepant weight perception, height and weight were objectively measured and used to calculate BMI. The participants were also asked, "Do you consider yourself now to be overweight, underweight, or about the right weight" (Kuchler and Variyam, 2003). We then created a discrepant weight variable by categorizing the participants into three subgroups:

Those who have an accurate weight perception (i.e., measured BMI was between 18.5 kg/m^2 and 24.9 kg/m^2) and they self-reported being the "right weight." We labeled this as "accurate weight perception".

Those who say that they are normal weight, but are overweight (i.e., BMI was >25 kg/m^2), which we labeled as "underestimate weight."

Those who say that they are overweight, but are normal weight (BMI was between 18.5 kg/m^2 and 24.9 kg/m^2), which we labeled as "overestimate weight."

Notably, due to few participants considering themselves as underweight, these individuals were not evaluated herein.

2.3. Physical activity

At the MEC, the participants who were able to walk were asked to wear an ActiGraph 7164 accelerometer on their right hip for 7 days. Accelerometers were fastened to an elastic belt worn around the participant's waist near the iliac crest. The participants were asked to wear the accelerometer during all activities, except during water-based activities and while sleeping. The accelerometer measured the frequency, intensity, and duration of physical activity by generating an activity count proportional to the measured acceleration (Loprinzi et al., 2014). Additional details about the mechanics of accelerometry can be found elsewhere (Chen and Bassett, 2005). Estimates for physical activity were summarized in 1-minute epochs. Activity counts >2020 per minute were classified as MVPA (Troiano et al., 2008). To determine the amount of time the monitor was worn, non-wear was defined by a period of a minimum of 60 consecutive minutes of zero activity counts, with the allowance of 1 to 2 min of activity counts between 0 and 100. The participants were given $40.00 upon the return of accelerometers.

2.4. Covariates

Unless stated otherwise, all of the following covariates were included in each model: age, gender, race–ethnicity, and socioeconomic status. Age, gender, and race–ethnicity were self-reported. Socioeconomic status was assessed using the poverty income ratio (PIR). Ranging from 0 to 5, PIR was defined as the ratio of the family income to the federal poverty threshold. For example, a PIR of .5 suggests that the family income is 50% below the poverty threshold.

2.5. Data analysis

A negative binomial logistical regression was used to assess the association between discrepant weight perception (independent variable) and engagement in MVPA (outcome variable). A negative binomial logistic regression was used because MVPA was highly skewed and in the form of count data. To examine whether any effect moderation was present, separate models were computed for gender, race–ethnicity, age group, and poverty level. These person-based (sub-group) tests of moderation were used to examine for whom (e.g., which individuals) the potential relationship was observable.

3. Results

Table 1 displays the weighted sample characteristics. Table 2 displays the weighted regression associations between weight perception and MVPA, with results stratified by age, gender, race–ethnicity, and poverty level. When comparing the entire sample, and after adjustments, weight discrepancy was not associated with engagement in MVPA; for underestimate vs. accurate: RR = .98, 95% CI: .89–1.07, $P = .62$; for overestimate vs. accurate: RR = 1.08, 95% CI: .96–1.22, $P = .21$. However, there was some evidence of effect moderation by gender and age. Females who said that they are normal weight, but were in fact overweight, engaged in 13% less MVPA (RR = .87, 95% CI: .769–.999, $P = .05$). Also, older adults (>60) who said that they are normal weight, but were overweight, engaged in 23% less MVPA (RR = .77, 95% CI: .616–.965, $P = .025$). Race–ethnicity and poverty did not moderate the relationship between weight perception and MVPA engagement. Additional analyses included education status as a covariate, and with its inclusion, the results were unchanged (data not shown). Additionally, there was no evidence of multicollinearity in the models, as the mean variance inflation factor was 1.2, the highest individual variance inflation factor was 1.85, and the lowest tolerance statistic was .53.

Table 1
Weighted sample means (standard error) for selected characteristics of the NHANES 2003–2006 sample ($N = 5462$).

	Accurate[a]	Under[b]	Over[c]
Age/Years	46.5 (.5)	47.6 (.9)	44.1 (1.0)
% Female	54.4 (.9)	27.2 (1.7)	85.6 (2.3)
% NHW[d]	73.5 (2.1)	63.6 (3.0)	80.3 (3.1)
PIR	3.16 (.6)	2.93 (.8)	3.52 (.1)

[a] Those who have an accurate weight perception.
[b] Those who say that they are normal weight, but are overweight.
[c] Those who say that they are overweight, but are normal weight.
[d] Non-Hispanic White.