Examining weight concern and delay discounting in adolescent females

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ABSTRACT

Objective: Pediatric obesity is a growing public health concern that contributes to high rates of negative long-term physical and mental health outcomes. Research focused on identifying risk for pediatric obesity has linked delay discounting, or an inclination for immediate rewards, as well as weight concern to individuals with greater Body Mass Index (BMI). The current study seeks to fill a void in the literature by examining how these two variables interact to promote higher BMI in female adolescents.

Method: Adolescent ($n = 60$) females between the ages of 13–19 years ($m_{age} = 17.45$, $SD = 1.74$) of age completed the Eating Disorder Examination Questionnaire (EDE-Q) and the Delay Discounting Questionnaire.

Results: A mediation model examined whether delay discounting accounted for the relationship between weight concern and BMI. Results indicate that in the current study weight concern was negatively related to delay discounting and delay discounting was negatively related to BMI. The overall model revealed that a partial mediation occurred [b = 1.28, t(60) = 4.92, $p < 0.01$].

Discussion: These results suggest that while impulsivity is an important factor to consider, other constructs may also be influential in how weight concerns contribute to greater BMI. Nevertheless, the results indicate that prevention and interventions should identify females with high levels of both weight concern and impulsivity as an increased risk for experiencing pediatric obesity and long-term negative health outcomes.

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1. Introduction

Rates of adolescent obesity have quadrupled in the United States over the past three decades, increasing from 5% to 21% from 1980 to 2012 (Centers for Disease Control and Prevention (CDC), 2014). Pediatric obesity is defined as excess body fat that places youth at risk for both short term and long term mental and physical consequences; which includes acute risk for cardiovascular disease, pre-diabetes and bone/joint problems (CDC, 2014). Of further concern, 70% of obese youth will remain obese into adulthood, thus increasing their risk for long-term health problems including heart disease, type 2 diabetes, strokes, several cancers, and osteoarthritis (Dehghan, Akhtar-Danesh, & Merchant, 2005; CDC, 2014). In addition, due to bullying, stigmatization, and discrimination obese adolescents are also at risk for experiencing social and psychological problems, such as low academic achievement, low self-esteem, and depression (Dietz, 1998; Schwartz & Puhl, 2003; Vaczy, Seaman, Peterson-Sweeney, & Hondorf, 2011).

Due to the detrimental mental and physical health implications, research has focused on the epidemiology of pediatric obesity in order to improve prevention efforts. One risk factor that has been consistently linked to adolescent obesity is delay discounting. Delay discounting describes the extent to which an individual discounts the value of an outcome because of a delay to its occurrence. Delay discounting is considered a form of impulsive behavior and is associated with a number of forms of addiction (Bickel & Marsch, 2001; Reynolds, 2006). One means of assessing delay discounting is by having participants choose between immediate versus delayed monetary rewards; with individuals choosing more immediate outcomes being deemed more impulsive (Reynolds, Penfold, & Patak, 2008). In the context of eating behaviors, adolescents with higher discounting rates are thought to fail to consider the probable negative long-term consequences of unhealthy dietary behaviors (see Thamotharan, Lange, Zale, Huffhines, & Fields, 2013 for a review). Indeed, greater discounting in youth has been shown to be associated with higher BMIs, especially in adolescents.

Another risk factor that has been examined within the context of pediatric obesity is weight concern, defined in the current paper as preoccupation and dissatisfaction with one's weight. Overweight and obese youth have been shown to endorse greater weight concern compared to healthy weight peers (Calzo et al., 2012). And this relationship was further evidenced by a study revealing weight concern as a mediator in the relationship between BMI and a number of adverse mental health comorbidities including low self-esteem, body dissatisfaction, and depression (Allen, Byrne, Blair, & Davis, 2006).

The present study extends the examination of delay discounting and weight concern related to BMI in a sample of female adolescents. Only adolescent females were included in the current study, as women have been shown to have greater weight concern, especially when overweight or obese (Wardle & Johnson, 2002). The authors explore the

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association between weight concern and BMI, specifically if delay discounting mediates the relationship between weight concern and BMI. To the best of our knowledge, no research has investigated this subject. To this end, we examine delay discounting and weight concern as correlates of BMI in adolescent females. Provided past findings suggesting women with greater weight concern report a higher likelihood of engaging in dieting behaviors, we hypothesize that delay discounting will mediate the relationship between weight concern and BMI such that higher weight concern will lead to higher discounting behavior and greater BMI.

2. Methods

2.1. Participants

Participants consisted of female adolescents ($n = 60$), between the ages 13–19 years ($m_{age} = 17.45$, $SD = 1.74$) who received either (1) monetary compensation between $25–$35, with the specific amount earned dependent on task performance ($n = 40$) or (2) course credit for their participation ($n = 20$). Participants were excluded if they were not between the ages of 13–19 or were taking ADHD medication. The exclusion criteria were imposed because the present study was focused on adolescents and the medications used in the treatment of ADHD have been shown to reduce impulsive behavior as measured by the behavioral assessments included in the study (Tannock, Schachar, Carr, Chajczyk, & Logan, 1989). Participants were recruited using fliers distributed throughout the community and through undergraduate psychology courses. Interested persons voluntarily called the study hotline and were provided with a brief description of the study and screened for inclusion. Participants meeting inclusion criteria were invited to the laboratory where they were consented using documents approved by the Institutional Review Board, and participated in the testing session. Participants under the age of seventeen completed approved assent forms and parents signed consent.

2.2. Measures

2.2.1. Weight concern

Weight concern was assessed using the Eating Disorder Examination Questionnaire (EDE-Q; Fairburn, Cooper, & O'Connor, 2008). Weight concern questions queried "importance of weight," "reaction to prescribed weighing," "preoccupation with shape or weight," "dissatisfaction with weight," and "desire to lose weight." The scoring system consists of a 7-point Likert type scale, with 0 indicating no days and 6 indicating everyday in the 28-day period. Greater cumulative scores reflected more weight concern. Alpha for the total score in the current data set was acceptable ($\alpha = 0.78$).

2.2.2. Delay discounting

(DDQ; Madden, Petry, Badger, & Bickel, 1997; Richards, Zhang, Mitchell, & de Wit, 1999). The delay discounting questionnaire requires individuals to decide between delayed and immediate monies. The computerized task presents participants with choices between $10 available after a specified delay (1,2,30,180, or 365 days) and a smaller amount available immediately (i.e., 'would you rather have $10 in 30 days or $4 now?'). Smaller amounts chosen immediately reflect greater discounting by delay. This computerized task uses an adjusting amount procedure to derive indifference values. Indifference values were used to calculate discounting curves and analyzed with an area under the curve (AUC) method (Myerson, Green, & Warusawitharana, 2001), with smaller area values indicating greater monetary discounting.

2.3. Procedure

Once consented, participants were weighed and their height measured by study personnel. The weight status criteria are derived from the most recent Centers for Disease Control and Prevention National Center for Health Statistics growth curves based on age and sex (CDC, 2010). Participants then completed the DDQ and the EDE-Q. Participants completed other assessments not relevant to the current analyses, and are therefore not described here. The present study is cross-sectional and all assessments were administered in one session. In addition, task order was randomized for individual participants, to limit interference of task order on results. Total time for completing the study was about 2 h. All participants chose to complete the study after invitation.

2.4. Analytical approach

To assess orderliness of delay discounting data, the Johnson and Bickel (2008) algorithm was used. Discounting functions were identified as nonsystematic if any delay rating was at least 0.2 greater than the delay rating preceding it. Data analyses were conducted with SPSS 17.0. Bivariate associations with age, ethnicity, and BMI were done by conducting using Pearson's product-moment correlations to determine which demographic variables should be included as covariates. Mediation analyses were conducted using the four step approach outlined in Baron and Kenny (1986). Regressions conducted within the mediation model included weight concern, delay discounting, and BMI (see Fig. 1). No covariates were included in the model, as both age and ethnicity were not significantly associated with BMI. To test the mediation model, ordered regressions were used to test a, b, ab, c, and c′ pathways. Mediation occurred if the effect of the "c" pathway decreased in the "c′" pathway. Due to the sample size, bootstrapping was employed to determine the pathway coefficients, standard errors, and the confidence interval of the indirect pathway (ab).

3. Results

3.1. Sample characteristics

The majority of participants reported a Euro-American ethnicity ($n = 43$, 71.67%), while others reported Hispanic ($n = 7$; 11.67%), African-American ($n = 4$; 6.67%), Other ($n = 4$; 6.67%), and Asian ($n = 2$; 3.33%) ethnicities (see Table 1). Average delay discounting AUC was 0.52 ($SD = 0.28$). The average weight concern score was 1.88 ($SD = 1.64$) and the average BMI was 22.56 ($SD = 3.99$; Table 1). These values were comparable to similar samples (Fairburn et al., 2008; Fields, Sabet, & Reynolds, 2013; Woodward, Rizk, Wang, & Treat, 2014).

3.2. Descriptive data

The data were screened for integrity. With regard to orderliness of data, 9 (15.0%) of all monetary discounting functions were found to be non-systematic. However, in 7 delay discounting cases only a single data point of the five indifference points was aberrant. Data were also examined for normality of distribution and to determine if regression analyses could be conducted. To determine a linear relationship, the authors used a scatter plot and calculated Mahalanobis distance to detect any outliers, for which two participants BMI was found to be an
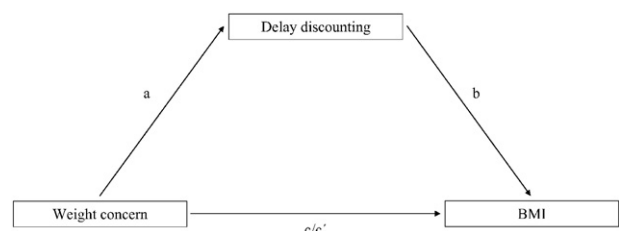

Fig. 1. Mediation model of delay discounting, weight concern and BMI.