



Effects of weight and gender on a task of inattention



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ABSTRACT

Objective: Previous studies have established that obese adolescents possess a stronger tendency to behave more impulsively and be more inattentive than healthy-weight children. Additionally, gender difference in inattention and impulsivity has also been substantiated by previous researchers. The current study examined the relationship between gender, body weight, and inattention and impulsivity in adolescents. It was hypothesized that obese males and females would have more inattentive and impulsive responses than their healthy-weight peers.

Method: Participants were 113 adolescents between the ages of 14 and 19; all participants completed the CPT-II, a measure of inattentive and impulsive response styles.

Results: Findings indicated that males who were classified as overweight or obese scored higher on inattention than did obese females, healthy-weight males, and healthy-weight females. Additionally, females committed a greater number of commission errors and were less able to distinguish the target stimuli, suggestive of impulsive responding.

Conclusion: These findings indicate a gender difference in regard to impulsive responding, and also reveal an interaction of weight status and gender on inattention. Implications for prevention and treatment are discussed.

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1. Introduction

Pediatric obesity has reached epidemic proportions over the past few decades and has been cited as one of the top six causes of death and disability among youth (Youth Risk Behavior Surveillance System (YRBSS), 2014). Pediatric obesity not only affects physical health, but also it negatively impacts social development through social marginalization (Barlow & Committee, 2007; Freedman, Mei, Srinivasan, Berenson, & Dietz, 2007; Han, Lawlor, & Kimm, 2010; Vaczy, Seaman, Peterson-Sweeney, & Hondorf, 2011; Whitlock, Williams, Gold, Smith, & Shipman, 2005). In spite of these negative effects, a subset of overweight and obese adolescents remains overweight or obese. The current study sought to better understand underlying factors in adolescent weight status by investigating the potential relationship of both impulsive and inattentive response styles and adolescent weight status.

Behavioral choice theory suggests that youth engaging in excessive eating adversely focus their attention on present satisfaction (i.e., food indulgence) and fail to consider the potential long-term consequences and benefits of their consummatory and behavioral choices (Epstein, Myers, Raynor, & Saelens, 1998). Inattention can be conceptualized as a failure of attending to appropriate stimuli, as well as the ability to

discriminate and ignore distracting stimuli (Reynolds, Penfold, & Patak, 2008). Therefore, inattention may contribute to the increased prevalence of adolescent obesity as the inability to attend to stimuli may affect perceptions of both hunger and satiety, as well as one's ability to recall long-term weight-loss goals (Davis, Levitan, Smith, Tweed, & Curtis, 2006). However, few studies have investigated this relationship and the potential role of inattention.

Research has also indicated that failure to modify excessive eating may be due to a lack of impulse control, whereby obese adolescents are more impulsive than healthy-weight peers (Fields, Sabet, Peal, & Reynolds, 2011). A recent meta-analysis examining the role of impulsivity in pediatric weight status revealed that although impulsivity failed to be a predictor of weight status in young adolescents, this relationship strengthened with age, such that older adolescents' weight status was affected by levels of impulsivity (Drukker, Wojciechowski, Feron, Mengelers, & Van Os, 2009; Thamocharan, Lange, Zale, Huffhines, & Fields, 2013). Additionally, early findings suggest that impulsivity affects adolescents' ability to control their food intake and these individuals may have poorer inhibitory control compared to healthy-weight peers (Nederkoorn, Braet, Van Eijs, Tanghe, & Jansen, 2006).

Provided that few studies have examined the effects of impulsivity, inattention, and gender on the weight status of an exclusively adolescent sample, the current study adds to this literature by comparing performance in healthy-weight and overweight/obese male and female adolescents on a task of both attention and impulsivity. The objective for the present analyses was two-fold: (1) to address a gap in the literature suggesting that overweight and obese adolescents may be more

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vulnerable to a failure of attention and more impulsive response styles, and (2) to address gender differences in inattention and its manifestation as a function of weight status. It was hypothesized that overweight and obese adolescents would have greater levels of inattention and impulsive responding compared to healthy-weight controls.

2. Material and methods

2.1. Participants

One-hundred and thirteen adolescents between the ages of 14 and 19 ($M = 18.6$; $SD = 1.1$) participated in the current study. Participants were classified as either (a) healthy-weight, possessing a body mass index (BMI) between the 5th and 85th percentiles for age and sex ($n = 62$), or (b) overweight/obese, possessing a BMI greater than the 85th percentile for age and sex ($n = 51$). The sample consisted of 50 males (44%) and 63 females (56%). Additionally, the sample was primarily Caucasian (74.2%), followed by Hispanic (18.3%), African American (4.2%), Asian American (1.7%), and Other (1.7%). Participants were recruited from Brazos County, Texas, and surrounding counties via newspaper advertisements and flyers. Recruitment and phone interview screenings were conducted by the principal investigator or research technicians in the Psychology Department at Texas A&M University.

2.2. Procedure

All adolescents were screened and invited to the laboratory with a parent or legal guardian for one testing session. Following consent, participants' height and weight were measured, and BMI scores were calculated ($\text{weight (lb)} / [\text{height (in)}]^2 \times 703$). During the testing session, adolescents completed a battery of questionnaires. Next, participants completed behavioral tasks measuring impulsivity, including the CPT-II. Task order was counterbalanced, and standard instructions and a practice session were administered before each task. After completing the tasks, participants were compensated through either course credits or monetary compensation.

2.3. Assessment measures

Conners' Continuous Performance Test – II (CPT-II; Conners, 2004). The CPT-II is a computerized task designed to measure sustained attention and impulsive responding. Participants were asked to left click a computer mouse as quickly as possible when letters other than the letter X were presented (target stimulus) on the screen and to refrain from responding when the letter X (non-target stimulus) was presented. The outcome measures included number of omissions, number of commissions, hit reaction time (raw scores), reaction time standard error, and detectability. A high number of commission errors are suggestive of impulsive guessing, high omission errors suggest inattention, higher detectability suggests worse attentional capacity, and higher reaction times suggest sluggish responding (Conners, 2004).

2.4. Statistical analyses

All analyses were performed using SPSS 20.0. Demographic characteristics were compared using one-way ANOVAs for continuous variables and Chi-square for categorical variables. Outcomes from the CPT-II were compared using a between subjects 2×2 MANOVA, and all CPT parameter correlations are presented in Table 1. Weight status and gender were the grouping variables, and significant effects were further explored using LSD post hoc analyses.

3. Results

A significant interaction between weight status and gender was found for number of omissions ($F(1,109) = 6.467$, $p = .01$, $n_2 = .056$).

Table 1
Correlations of CPT parameters.

	RT	Commissions	Omissions	d'	RT (SE)
RT	–				
Commissions	–.636 ^a	–			
Omissions	.124	.035	–		
d'	–.525 ^a	.845 ^a	.017	–	
RT (SE)	.396 ^a	.014	.569 ^a	–.080	–

Note. RT = reaction time and SE = standard error.

^a Indicates that the correlation is significant at the 0.01 level (2-tailed).

Overweight/obese males committed significantly more omissions ($M = 94.121$; $SD = 46.646$) than healthy-weight males ($M = 68.455$; $SD = 24.793$) and females [both healthy-weight ($M = 65.308$; $SD = 32.497$), and overweight/obese ($M = 60.011$; $SD = 18.822$)]. Additionally, a significant main effect of gender was found for omissions ($F(1,109) = 9.36$, $p = .003$, $n_2 = .079$). Specifically, males ($M = 81.29$, $SD = 4.28$) had significantly more omissions compared to female participants ($M = 62.66$, $SD = 4.33$). There was no effect of weight status on number of omissions. The interaction of weight status and gender was not significant for number of commissions; however, a significant main effect of gender was found for commissions ($F = 9.591$, $p = .002$) such that females ($M = 70.283$, $SD = 2.266$) had a greater number of commissions than males ($M = 63.210$, $SD = 1.968$). Gender, weight status, and their interaction had no significant effects for Hit Rate or Hit Rate standard error. Finally, when investigating group differences in detectability, a significant main effect of gender was found ($F = .467$, $p < .001$). Females were less able to distinguish target stimuli ($M = 61.550$, $SD = 5.866$) compared to males ($M = 56.290$, $SD = 7.194$). No effect was found for weight status or the interaction of weight and gender for detectability scores. Summaries of all findings are presented in Table 2.

4. Discussion

The current study sought to determine whether performance differed among male and female healthy-weight and overweight/obese participants on a task assessing impulsivity and inattention. A significant interaction of weight status and gender on the level of omissions was observed among adolescent males and females. Consistent with past research, which has suggested a link between obesity and inattention, our findings also support an increased level of inattention as weight increases, such that males committed significantly more omission errors than any other group (Agranat-Meged et al., 2008; Altfas, 2002; Chen, Hsiao, Hsiao, & Hwu, 1998).

A number of mechanisms have been proposed to explain the increased level of inattention observed among individuals who are overweight and obese. One such explanation posits that inattention may affect an individual's ability to complete goal-directed dietary behaviors and/or physical activity, which could lead to poor eating habits and unhealthy dieting patterns (Davis, 2010). This theory, coupled with the Behavioral Choice Theory, suggests these individuals adversely focus their attention and seek immediate food rewards and develop maladaptive, irregular eating habits (Epstein et al., 1998). In the current findings, it appears that males may be most susceptible to these irregular dietary behaviors, which may result in excess weight. Thus, obesity intervention and prevention efforts may augment success by implementing strategies to improve sustained attention, as these behaviors may affect one's ability to self-monitor and adhere to dietary goals. Future research should work to further discern if a gender difference exists in goal-directed behaviors and the effects this may have on dietary behaviors.

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