Attachment Style and Obesity: Disordered Eating Behaviors as a Mediator in a Community Sample of Canadian Youth

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ABSTRACT: Objective: Obesity and overweight are associated with many negative health outcomes. Attachment style has been implicated in the development of obesity in youth. The present study examined if disordered eating behaviors mediate the relationship between attachment style and body mass index (BMI) in a large community sample of Canadian youth. Method: A total of 3,043 participants (1,254 males and 1,789 females, M_age = 14.20 years) completed self-report questionnaires including the Relationship Questionnaire and the Dutch Eating Behavior Questionnaire, and BMI was objectively measured. Disordered eating behaviors (restrained, emotional, and external) were examined as possible mediating mechanisms in the relationship between attachment style and BMI z-score, using a multiple mediation model using bootstrapping while controlling for socio-demographic covariates. Results: Insecure attachment was significantly associated with higher BMI, and disordered eating mediated this relationship. Restrained eating was the strongest mediator of this pathway. Conclusion: Results suggest that it may be important to take attachment history and restrained eating into account when designing treatment and prevention strategies for obesity in youth.


Rates of overweight and obesity have increased significantly among children and adolescents over the past 30 years. Epidemiological studies show that 25%–30% of children and youth in Canada are overweight or obese,1 a prevalence that is comparable with that in the United States2 and other Western countries. This is of serious public health concern given that childhood overweight and obesity are associated with significant medical and psychosocial comorbidity3 and childhood obesity tracks into adulthood.4

The study of self-regulation is increasing in popularity in the field of pediatric obesity. Broadly speaking, self-regulation can be defined as a conscious or unconscious effort by an individual to change his or her inner states.5 Healthy self-regulatory behaviors begin to develop during infancy and are promoted by a healthy attachment relationship between an infant and a caregiver.6 Therefore, it may be useful to conceptualize the development of healthy and unhealthy self-regulated eating behaviors within the broader theoretical framework of attachment theory.

Attachment theory posits that human beings have an innate need to form attachment bonds with others.6 The formation of the attachment bond between an infant and a caregiver begins early in life and functions as a way of gaining the attention and physical proximity of the primary caregiver during times of distress.6 A secure attachment bond develops when the caregiver responds to the child’s cues of distress in a consistent manner.6 If the caregiver is not accessible or not responsive, over time an insecure attachment may develop.6 Individuals internalize experiences with their primary caregivers to form cognitive schemas of relationships.6 These schemas influence relational styles throughout life, are relatively

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stable over time,\textsuperscript{7} and also influence strategies used to regulate distress and emotions.\textsuperscript{9} During adolescence, attachment behaviors become more directed toward peers, such as best friends or romantic partners.\textsuperscript{9} Attachment also has roots in physiology. A secure attachment bond has been shown to help maintain and stabilize biological rhythms,\textsuperscript{10–12} including hunger and satiety.\textsuperscript{15}

There is a paucity of research on the role of attachment in the development of pediatric obesity. Anderson and Whitaker examined the relationship between attachment style and obesity in a sample of 6,650 two-year-old US children.\textsuperscript{14} Results of this prospective cohort study indicate that children with an insecure attachment pattern were at increased risk for obesity at 4.5 years of age, even after accounting for confounding factors.\textsuperscript{14} In a later study, a poor mother-child relationship in childhood was associated with a higher prevalence of obesity in adolescence.\textsuperscript{15} Goossens and colleagues found that in a sample of 601 Dutch children, insecure attachment in preadolescence longitudinally predicted increases in restrained eating and body mass index (BMI) 1 year later, after controlling for gender, baseline eating psychopathology, and baseline weight.\textsuperscript{16} Some studies have focused on parental attachment alone and the risk of childhood obesity. For example, Mazzeschi and colleagues found that in a sample of 87 parents, both maternal and paternal insecure attachment was associated with childhood obesity.\textsuperscript{17} In general, studies have shown that the quality of the early parent-child relationship or insecure attachment in childhood/preadolescence is related to obesity, but the mechanisms are still unknown.

Maladaptive eating behaviors, such as emotional eating, external eating, and restrained eating, can lead to positive energy balance and weight gain over time.\textsuperscript{18} These 3 types of maladaptive eating behaviors were derived from 3 theories of obesity: psychosomatic theory, externality theory, and restraint theory, respectively. Psychosomatic theory postulates that emotional eating, defined as excessive eating in response to emotional arousal, plays a role in the cause of obesity via 2 possible mechanisms: (1) poor interoceptive awareness because of the inability to distinguish between feelings of hunger, satiety, and emotional arousal; or (2) using food to reduce emotional distress.\textsuperscript{19} Although several laboratory studies have found that obese individuals tend to overeat in the presence of negative emotions, such as stress or anxiety, when compared with normal-weight individuals and when the food is palatable.\textsuperscript{20} Most cross-sectional studies examining emotional eating in adolescents have not found an association between emotional eating and weight.\textsuperscript{21–23} A more recent longitudinal study found that emotional eating was not related to BMI trajectories among adolescents.\textsuperscript{24}

Externality theory posits that obesity develops because of overeating as a result of poor interoceptive awareness,\textsuperscript{25} and overeating is triggered by external food cues, such as the sight or smell of food.\textsuperscript{26} Therefore, externality theory posits that obesity develops because of external eating, and this theory may explain why some individuals overeat in today’s food-rich, “obesogenic” environment. However, the support for externality theory is mixed, with many but not all studies showing cross-sectional associations between higher external eating and lower BMI in youth\textsuperscript{23,27,28} and others finding no association.\textsuperscript{24}

Restraint theory postulates that the constant restriction of food for the purpose of weight loss (restrained eating) will reach a breaking point and result in disinhibited eating, overconsumption, and subsequent weight gain. This cycle can further dysregulate the body’s hunger and satiety cues and can lead an individual to rely on contextual cues for eating, often in the absence of hunger.\textsuperscript{29} There is an abundance of research demonstrating that restrained eating is cross-sectionally and longitudinally\textsuperscript{30–34} predictive of weight gain and overweight/obesity in youth; however, there is emerging evidence that increased body weight leads to restrictive eating, highlighting the potential bidirectionality of these relationships.\textsuperscript{35,36}

Little research has examined the association between attachment style, disordered eating, and obesity in youth. Maladaptive eating behaviors are modifiable risk factors and thus possible intervention targets. Increased knowledge could help guide future obesity intervention and prevention efforts in youth. The primary objective of the present study was to examine the relationship between attachment style and BMI and investigate whether emotional, external, or restrained eating mediated this relationship. It was hypothesized that an insecure attachment style would predict higher BMI and that this relationship would be mediated by dysregulated eating behaviors. Examining the relative strengths of each disordered eating–related mediator was a secondary objective. We hypothesized that insecure attachment would be associated with greater BMI via increased restrained eating, given the previous research demonstrating an association between restrained eating and increased BMI, combined with data showing that insecure attachment leads to poor emotional and behavioral regulation of appetitive behaviors.

**METHODS**

**Participants**

Participants were 3,043 Grade 7 to 12 students (1,254 males and 1,789 females), representing approximately 45% of all students approached. Students ranged in age from 11.08 to 20.75 years ($M = 14.20$ years, $SD = 1.61$). Data were collected as part of a larger study: the Research on Eating and Adolescent Lifestyles (REAL) study.

**Procedure**

Briefly, 41 public and 3 private schools in Canada’s Capital Region participated in the study. Research staff supervised survey completion during regularly
scheduled class time and collected objective measures of weight and height. Informed consent was obtained from students and parents. This study was approved by the relevant institutional research ethics boards. Details of the study procedure have been published elsewhere.27

Measures

Body Mass Index

Height and weight were objectively measured by a research staff in a private space using an HM200P Portable Stadiometer and an UC-321 Digital Weighing Scale (Quick Medical Equipment and Supplies, Issaquah, WA). BMI was calculated by dividing weight in kilograms by height in meters squared. It is important to interpret BMI in relation to each participant’s developmental stage because the sample consists of youth ranging in age from 11 to 20 years. As such, a BMI-for-age z-score was calculated for each participant using the WHO guidelines (WHO Reference 2007 for 5–19 year olds).37 BMI z-score was used as the outcome variable.

Attachment

The Relationship Questionnaire (RQ) was used to assess global attachment.38 The language of the RQ was previously adapted by Scharfe39 to make it more suitable to adolescents.39 For example, “It is easy for me to become emotionally close to others” was revised to “It is easy for me to feel close to people.” The RQ examines the adolescent’s self-perceived attachment to others by asking youth to read 4 descriptions of relationship attitudes, each reflecting one of the following attachment styles: secure, fearful, preoccupied, or dismissing. Participants rated each relationship attitude on a 7-point Likert scale: 1 (not at all like me) to 7 (very much like me). The questionnaire also includes a forced-choice question, where participants identify one attachment style description that most closely resembles them. Participants were categorized as either securely or insecurely attached based on their responses to the forced-choice item. The Likert items were used to categorize participants if they did not answer the forced-choice item. For example, if a participant skipped the forced-choice question, but rated 1 of the 4 attachment styles much higher on the Likert items, then we were able to complete missing data and categorize the participant as either secure or insecure. This was only possible for 30 participants, as most of the participants who skipped the forced-choice item also skipped the Likert items.

The RQ is a widely used measure of global attachment in youth and adults and has demonstrated good psychometric properties.38,40 The RQ has demonstrated moderate test-retest reliability over 8 months, with 71% of females (k = 0.42) and 61% of males (k = 0.20) being judged as stable on the secure/insecure classification.41 Overall, many studies have effectively used the RQ to assess attachment in middle childhood and adolescence.42–45 The validity of the RQ in this population is supported by research indicating that it correlates with other measures of attachment,40,46,47 with mental health constructs,48 and it has demonstrated predictive validity for parenting style in children and adolescents; secure attachment was associated with authoritative parenting.49

Eating Behaviors

The Dutch Eating Behavior Questionnaire (DEBQ) is a 33-item self-report questionnaire measuring 3 dimensions of eating: the emotional eating subscale taps into the tendency to eat in response to negative emotions; the restrained eating subscale assesses the degree to which one restricts food intake to control body weight; and external eating assesses the degree to which external (environmental) food cues trigger eating.18 Items are rated on a Likert scale (1 = never to 5 = very often), with higher scores indicating more severe disordered eating.18 The DEBQ has strong reliability and validity data, with Cronbach’s alpha coefficients ranging from .79 to .95,18 and has been validated in children and adolescents from 7 to 17 years.50 In this study, Cronbach’s alpha for the emotional eating, restrained eating, and external eating subscales were .95, .92, and .87, respectively.

Socio-demographics

Age, sex, ethnicity, parental education, and school geographic area were included as covariates in the present study. Age, sex, ethnicity, and parental education were collected by student self-report. Age was controlled for as both height and weight increase with normal development.51 Sex was controlled as the prevalence of overweight and obese boys exceeds that of girls.1 Ethnic differences in overweight and obesity are documented in the literature and were therefore controlled for as well.52 This covariate was dichotomized: white or another ethnic background. Low socioeconomic status is a risk factor for obesity53,54 and is associated with insecure attachment.55 Parent education was used as a proxy measure of socioeconomic status and was controlled for in the present study. This covariate was dichotomized such that low was defined as neither parent completing college and high was defined as at least one parent completing college. Urban-rural differences have been documented in the literature, such that there tends to be a higher prevalence of overweight and obesity in rural communities versus urban/suburban ones.56 As such, this variable was controlled for in the analyses.

Data Analytic Strategy

The statistical package for the social sciences (SPSS Inc.) version 24.0 with an alpha level of p < .05 was used for all analyses. Age, sex, ethnicity, parental education, and school geographic area were included as covariates in all analyses. Missing data on attachment style and covariates were not imputed. Participants with missing attachment style did not differ from the final sample on age, sex, ethnicity, parental education, BMI, or eating behaviors (restrained, emotional, or external). To test if attachment style predicted BMI, a multiple linear regression analysis was conducted, controlling for
covariates. Next, a multiple parallel mediation analysis was conducted to test if the set of eating behaviors mediated the relationship between attachment style and z-BMI. The multiple mediation model tested the overall mediation effect for all mediators in the model simultaneously (i.e., the total indirect effect), and it was possible to test the effects of each mediator separately, while controlling for all other mediators in the model (i.e., specific indirect effect).\textsuperscript{57} The proportion of effect mediated was calculated as follows: Path $a \times$ Path $b$/Path $c$ (i.e., indirect effect/total effect). Moderating effects of sex were also tested. The mediation analysis was performed with the bootstrapping approach (5,000 samples with replacement), which generates nonparametric approximate estimates of the sampling distributions of the indirect effects. Ninety-five percent bias-corrected and accelerated confidence intervals (BCa 95% CI) are reported. The Indirect and Process macros used for the analyses can be found at: http://www.afhayes.com.

RESULTS

Descriptive characteristics are presented in Table 1. On average, the mean age of the sample was 14 year old, with a mean BMI of 21.28 kg/m$^2$. Most of the sample came from well-educated families, which is representative of the Ottawa area.\textsuperscript{58} Approximately 70% of the sample reported a secure attachment style, which is similar to previous research.\textsuperscript{59} The means for restrained, emotional, and external eating were comparable with means found in previous studies with non-Canadian youth.\textsuperscript{23,60} Bivariate correlations are presented in Table 2. Most of the correlations were in expected directions.

Attachment Style as a Predictor of Body Mass Index

Results of the linear multiple regression (Table 3) indicate that attachment style significantly predicted BMI z-score, $F(6,2733) = 11.40, p < .001, R^2 = .024$ (adjusted $R^2 = .022$). Specifically, youth with an insecure attachment style had a higher z-BMI compared with those with a secure attachment style. The interaction between attachment style and sex was not significant, $B = -0.006$, SE = 0.094, $t_{(2732)} = -0.224, p = .882$, 95% CI = [-0.205 to 0.163]. That is, sex did not moderate the relationship between insecure attachment style and a higher z-BMI.

Parallel Multiple Mediation and Moderation Analyses

To investigate whether emotional, external, or restrained eating mediated the relationship between attachment style and z-BMI, a multiple parallel mediation analysis was conducted, controlling for sociodemographic variables. Bootstrapped estimates for the total indirect effect and specific indirect effects and BCa 95% CIs are presented in Table 4 and Figure 1. The total indirect effect of attachment style on BMI z-score through the set of dysregulated eating behaviors (with covariates in the model) was significant, $F(9,2714) = 67.03, p < .001$, with $R^2 = .182$ (adjusted $R^2 = .179$).

The specific indirect effects of restrained eating and external eating were significant, as demonstrated by BCa 95% CIs that did not contain zero. Restrained eating was a significant mediator such that insecure attachment was positively related to restrained eating behavior ($B = 0.24$), which was positively associated with z-BMI ($B = 0.55$). External eating was also a significant mediator such that insecure attachment was positively related to external eating ($B = 0.09$), which, in turn, was negatively associated with z-BMI ($B = -0.25$). Emotional eating was not a significant mediator. The relative strengths of the specific indirect effects were compared using pairwise contrasts. Restrained eating was a significantly stronger mediator than external and emotional eating. The proportion of effect mediated by restrained eating was 82.5% and that by external eating was 14.1%.

The specific indirect effect of attachment style on z-BMI through restrained eating was significantly stronger mediator than external and emotional eating. The proportion of effect mediated by restrained eating was 82.5% and that by external eating was 14.1%.

### Table 1. Descriptive Characteristics of the Sample

<table>
<thead>
<tr>
<th>Indicator</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>3,002</td>
<td>14.12</td>
<td>1.50</td>
<td>11.08–19.00</td>
</tr>
<tr>
<td>Body mass index (kg/m$^2$)</td>
<td>3,001</td>
<td>21.28</td>
<td>3.87</td>
<td>14.14–43.94</td>
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<td>Eating behaviors$^d$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restrained</td>
<td>2,973</td>
<td>1.71</td>
<td>0.74</td>
<td>1.0–5.0</td>
</tr>
<tr>
<td>Emotional</td>
<td>2,974</td>
<td>1.75</td>
<td>0.78</td>
<td>1.0–5.0</td>
</tr>
<tr>
<td>External</td>
<td>2,971</td>
<td>2.63</td>
<td>0.75</td>
<td>1.0–5.0</td>
</tr>
</tbody>
</table>

*Eating behaviors were measured by subscale scores of the Dutch Eating Behavior Questionnaire.

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moderated by sex while controlling for sociodemographic factors, parameter estimate (standard error; SE) = -0.13 (0.04), 95% BCa (-0.20 to -0.06). Examination of the conditional specific indirect effects by sex revealed that the restrained eating pathway was stronger for females, parameter estimate (SE) = 0.18 (0.03), 95% BCa (0.13–0.24), than for males, parameter estimate (SE) = 0.05 (0.02), 95% BCa (0.01–0.10), but was significant for both. The specific indirect effects through external and emotional eating, and the direct effect of attachment style on z-BMI were not moderated by sex (all BCa 95% CIs contained zero). The specific indirect effect of attachment style on z-BMI through the dysregulated eating behaviors was not significantly moderated by age.

**DISCUSSION**

To our knowledge, the present study is the first to examine the role of dysregulated eating behaviors in the relationship between attachment style and z-BMI in a large community sample of adolescents. Attachment significantly predicted z-BMI, such that secure attachment was more strongly associated with lower BMI and insecure attachment was associated with higher BMI. Although previous pediatric studies have demonstrated that an insecure attachment style in childhood increases the risk of overweight and obesity,\(^{14–16}\) no research to date has explored the putative mechanisms responsible for this relationship in a large community sample of mid- to late adolescents. This study adds to the limited research by examining the total and specific indirect effects of dysregulated eating behaviors in the relationship between attachment style and BMI in one parsimonious model. The set of dysregulated eating behaviors significantly mediated the relationship between attachment style and BMI while controlling for covariates. Contrasts of specific indirect effects revealed that restrained eating was the strongest mediational pathway, followed by external eating. Emotional eating was not a significant mediating pathway in the present community sample of youth.

Some researchers\(^{14,64}\) have speculated that poor emotional regulation is the driving force linking insecure attachment and increased BMI, drawing on psychosomatic theory\(^ {19}\) for theoretical support. Results of the present study are partially consistent with psychosomatic theory

### Table 2. Correlations Between Attachment Style and Other Variables of Interest

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
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<tbody>
<tr>
<td>1. Attachment</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. BMI</td>
<td>.078**</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Age</td>
<td>.086**</td>
<td>.277***</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Sex</td>
<td>-.051</td>
<td>-.011</td>
<td>-.012</td>
<td>—</td>
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<td></td>
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<tr>
<td>5. Ethnicity</td>
<td>.006</td>
<td>-.001</td>
<td>.023</td>
<td>.025</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>6. Parental education</td>
<td>-.082**</td>
<td>-.065**</td>
<td>.003</td>
<td>.043*</td>
<td>-.023</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. School geographic area</td>
<td>.041*</td>
<td>.134*</td>
<td>.171***</td>
<td>-.110**</td>
<td>-.188**</td>
<td>-.188**</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>8. DEBQ-R</td>
<td>.155**</td>
<td>.325**</td>
<td>.120**</td>
<td>-.246**</td>
<td>.026</td>
<td>.009</td>
<td>.052**</td>
<td>—</td>
</tr>
<tr>
<td>9. DEBQ-Ex</td>
<td>.067**</td>
<td>-.074**</td>
<td>.246**</td>
<td>-.042*</td>
<td>.038*</td>
<td>.121**</td>
<td>-.002</td>
<td>.058**</td>
</tr>
<tr>
<td>10. DEBQ-Em</td>
<td>.156**</td>
<td>.050**</td>
<td>.196**</td>
<td>-.282**</td>
<td>-.025</td>
<td>.004</td>
<td>.071**</td>
<td>.294**</td>
</tr>
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</table>

### Table 3. Linear Multiple Regression Analysis Predicting Body Mass Index z-Score From Attachment Style

<table>
<thead>
<tr>
<th>Block 1</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>95% CI</th>
</tr>
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<tbody>
<tr>
<td>Age</td>
<td>-.019</td>
<td>0.014</td>
<td>-.025</td>
<td>-1.311</td>
<td>.190</td>
<td>-.046 to 0.009</td>
</tr>
<tr>
<td>Sex</td>
<td>0.254</td>
<td>0.042</td>
<td>.115</td>
<td>6.045</td>
<td>&lt;.001</td>
<td>0.172 to 0.337</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>0.016</td>
<td>0.048</td>
<td>.006</td>
<td>0.325</td>
<td>.745</td>
<td>-.078 to 0.110</td>
</tr>
<tr>
<td>Parental education</td>
<td>-0.096</td>
<td>0.047</td>
<td>-.039</td>
<td>-2.026</td>
<td>.043</td>
<td>-.180 to -.003</td>
</tr>
<tr>
<td>School geographic area</td>
<td>0.118</td>
<td>0.029</td>
<td>.081</td>
<td>4.023</td>
<td>&lt;.001</td>
<td>0.060 to 0.175</td>
</tr>
</tbody>
</table>

Block 2

| Attachment | 0.155 | 0.046 | .064 | 3.378 | .001 | 0.065 to 0.245 |

\(R^2 = .024, \text{ adjusted } R^2 = .022, R^2 \text{ change } = .004. \text{ Control variables include age (years), sex (0 = female, 1 = male), ethnicity (1 = white, 2 = other), parental education (0 = neither parent complete college, 1 = at least one parent complete college), and school geographic area (1 = urban, 2 = suburban, 3 = rural); attachment (0 = secure, 1 = insecure); N = 2,740. CI, confidence interval.}
in that insecure attachment style did predict increased emotional eating after controlling for covariates; however, emotional eating was not significantly associated with higher BMI in this model. The bivariate correlation between emotional eating and BMI was positive and significant, but with 2 other dysregulated eating behaviors in the mediation model, it did not emerge as a significant mediating pathway. This suggests that although insecurely attached youth may overeat in response to emotional arousal or distress, this maladaptive eating behavior is not likely a major mechanism responsible for increased weight in insecurely attached youth in the community. Although this is not consistent with psychosomatic theory, it is consistent with several studies that have not found an association between emotional eating and BMI in youth.\textsuperscript{21,22,24,27}

Insecure attachment was significantly associated with restrained eating after controlling for covariates. That is, youth with an insecure attachment style were more likely to report that they were restricting their food intake, when compared with securely attached youth. This is in agreement with previous work by Goossens and colleagues who found that insecurely attached children had higher levels of restrained eating 1 year later and were at increased risk of weight gain.\textsuperscript{16} Moreover, restrained eating emerged as the strongest mediating pathway between insecure attachment and increased BMI, suggesting that restrained eating may play a central role in maintaining an unhealthy weight trajectory in youth. Although this was significantly moderated by sex, restrained eating was a significant mediator for both boys and girls. Many studies have found a relationship between restrained eating and increased BMI, but there is debate about the directionality of this relationship.\textsuperscript{35} It is likely that restrained eating and BMI have a bidirectional relationship whereby restricting food intake may result in overeating and weight gain over time,\textsuperscript{30} and weight gain and increased adiposity may lead to greater

<table>
<thead>
<tr>
<th>Effect</th>
<th>Parameter Estimate (SE)</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total indirect effect</td>
<td>0.1053 (0.0208)</td>
<td>0.0656</td>
<td>0.1468</td>
</tr>
<tr>
<td>Restrained eating</td>
<td>0.1326 (0.0192)</td>
<td>0.0978</td>
<td>0.1718</td>
</tr>
<tr>
<td>External eating</td>
<td>-0.0216 (0.0082)</td>
<td>-0.0403</td>
<td>-0.0077</td>
</tr>
<tr>
<td>Emotional eating</td>
<td>-0.0057 (0.0071)</td>
<td>-0.0198</td>
<td>0.0082</td>
</tr>
<tr>
<td>Contrasts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restrained vs external</td>
<td>0.1541 (0.0208)</td>
<td>0.1156</td>
<td>0.1955</td>
</tr>
<tr>
<td>Restrained vs emotional</td>
<td>0.1383 (0.0212)</td>
<td>0.0996</td>
<td>0.1823</td>
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<tr>
<td>External vs emotional</td>
<td>-0.0158 (0.0117)</td>
<td>-0.0431</td>
<td>0.0033</td>
</tr>
</tbody>
</table>

Table 4. Total and Specific Indirect Effects of Attachment Style on Body Mass Index z-Score Through Eating Behaviors (Restrained, External, and Emotional) Presented with Bias-Corrected and Accelerated (BCa) 95% Confidence Intervals (CI)

Analysis based on 5,000 bootstrap samples. Control variables include age, sex, ethnicity, parental education, and school geographic area. Sample size, N = 2,724. Bold font indicates significance at \( p \leq .05 \). SE, standard error.

Figure 1. Multiple parallel mediation examining eating behaviors (emotional, external, and restrained) as mediating mechanisms between attachment style (secure = 0, insecure = 1) and body mass index z-score (z-BMI). Control variables include age, sex, ethnicity, parental education, and school geographic area. Sample size, N = 2,724. Unstandardized regression coefficients (\( B \) values or slopes) generated using bootstrapping with 5,000 samples with replacement are presented, and standard errors are in parentheses. Model \( R^2 \) was 0.182. *\( p \leq .05 \); **\( p \leq .01 \); ***\( p \leq .001 \).
restraint of energy intake, creating a vicious cycle. Also, restrained eating can lead to weight gain because of a decrease in metabolic rate that results when food is restricted. Previous research has shown that dietary restraint was more strongly associated with overweight and obesity in youth than emotional eating, results that are consistent with the current findings.

Laboratory studies have consistently supported externality theory, demonstrating that overweight and obese individuals are more responsive to external food cues when compared with those in the normal-weight range. Results of the present study partially support externality theory, as insecure attachment was significantly related to increased external eating, suggesting that insecurely attached youth may be more likely to eat in response to external cues in their environment, rather than relying on biological cues of hunger and satiety. Consistent with previous research, external eating was associated with lower BMI in this sample. Although insecure attachment may increase the incidence of external eating, this eating behavior does not adequately explain the relationship between attachment style and BMI in a community sample when other disordered eating behaviors are considered in the same model. Although very speculative, it is possible that youth with higher BMIs underreport external eating because of stigma. Much more research into the relationship between attachment, external eating, and weight is needed.

The present study adds to a growing body of literature investigating how attachment style may contribute to the development or maintenance of overweight and obesity in youth. The gold standard treatment for pediatric obesity is family-based behavioral interventions, many of which include a caloric restriction component. However, given that restrained eating may mediate the relationship between insecure attachment and increased BMI, instructing insecurely attached youth to restrict their caloric intake may be contraindicated. Instead, individualizing treatment in ways that promote attachment security in youth may facilitate improved regulation of eating behavior that is critical for positive obesity treatment outcomes. Our findings also have important implications for pediatric obesity prevention as they suggest that a secure attachment bond and meeting the emotional needs of the child may lead to better regulation of eating behavior, which may translate to healthier body weight maintenance.

Limitations and Strengths

The first, and possibly the largest limitation of the present study, is its cross-sectional design, which does not allow for causal inferences. The potential bidirectionality of the relationships discussed cannot be ignored. For example, it is possible that increased weight could affect attachment orientation via teasing or bullying, which was not assessed in the present study. Although most of the prospective studies demonstrate that restrained eating is predictive of weight gain, it is possible that weight gain predicts restrained eating. Future research should also examine parental weight status and eating behaviors as covariates. Another limitation is that z-BMI was used to assess adiposity. Even though BMI is one of the most commonly used measures of adiposity in epidemiological studies because of feasibility and reliability, neither does it account for fat distribution nor does it discriminate between lean body mass and fat mass. The RQ is a widely used measure of attachment style and was used in the REAL study because of its ease of administration with large, community-based samples, but there are more robust measures available that should be considered in future studies, such as attachment interviews or parent report measures. Despite statistical significance of many of the tested pathways, the variance accounted for was small; this is likely because of a small effect size rather than a lack of statistical power. It is not surprising that attachment style accounted for a small proportion of the variance in BMI because numerous factors contribute to weight gain, such as genetics, nutrition, physical activity, and sedentary behavior. Given the large sample size, and relatively small effect sizes, it is important to not overinterpret the statistical significance of the current findings, but rather use them to inform future research.

Limitations of the present study are balanced with several strengths including a large representative sample of Canadian youth, objectively measured height and weight, and the inclusion of covariates. This was the first study to examine 3 types of disordered eating behaviors in one parsimonious multiple mediational model, which yielded important data that elucidated some potential behavioral mechanisms.

Summary and Conclusions

The most significant finding of the present study was that insecure attachment was associated with higher BMI in youth, and this relationship was mediated by restrained eating behavior. By including all 3 dysregulated eating behaviors in the same model, we were able to pit 3 theories of obesity against one another and determine that restrained eating was the strongest mediational pathway in the study sample. It is possible that youth who are insecurely attached try to overcompensate for their putative difficulty in regulating their emotions by using cognitive and behavioral restraint over their eating behavior, which may paradoxically predispose them to weight gain over time through previously described mechanisms.

The novel findings of this study suggest that attachment style could be a predisposing factor in the development of overweight and obesity in youth and suggests as well that restrained eating may be a possible mediating modifiable risk factor. Taken together, our findings suggest that attachment may be an important factor to consider in the treatment and prevention of pediatric obesity and that using family-based treatment...
that includes caloric restriction with insecurely attached youth could possibly be counterproductive. Future research should build on the present study to further examine how attachment style, particularly different types of insecure attachment, longitudinally relates to overweight and obesity in youth and the specific effects of mediating and moderating variables.

REFERENCES


