Impulse Control in Negative Mood States, Emotional Eating, and Food Addiction are Associated with Lower Quality of Life in Adolescents with Severe Obesity

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Abstract

Objectives Quality of life (QoL) is an important outcome to evaluate in adolescents with severe obesity, yet intrapersonal predictors of QoL are understudied. The current study assessed whether difficulty with impulse control when experiencing a negative mood (negative urgency) is associated with poorer QoL, mediated by more emotional eating and food addiction.

Method Participants consisted of 69 primarily female (71%), minority (76%) adolescents aged 13–21 (M age = 16.5, SD = 1.5) with severe obesity presenting for prebariatric surgery psychological evaluations. Structural Equation Modeling was used to appraise a model of the association of adolescent report of negative urgency with more emotional eating (Emotional Eating Scale for Children) and food addiction (Yale Food Addiction Scale) and poorer weight-related QoL (Impact of Weight on Quality of Life-Kids).

Results Greater difficulty controlling behavior when experiencing a negative mood was significantly associated with poorer weight-related QoL, mediated by more emotional eating and food addiction such that adolescents with severe obesity who reported more difficulties with impulse control in negative mood states were more likely to report more emotional eating and food addiction, which was in turn associated with lower QoL.

Conclusions Intrapersonal factors, including impulse control in negative mood states, are associated with lower QoL in adolescents with severe obesity. Interventions aimed at reducing frequency of negative affect, reducing impulsivity in negative mood states, and improving coping skills that are not eating based may contribute to improved QoL and merit further study.

Key words: adolescents; emotional eating; impulsivity; obesity; quality of life.
emotional, and social functioning. Research suggests that obesity has a significant impact on QoL (Butitta, Illiescu, Rousseau, & Guerrier, 2014), and for adolescents with severe obesity, their self-reported QoL is poorer than adolescents with lower classes of obesity or overweight (Varni, Limbers, & Burwinkle, 2007), as well as significantly lower than healthy adolescents and comparable with adolescents with cancer (Schwimmer, Burwinkle, & Varni, 2003). The effect of weight on QoL does not appear to differ for adolescents with severe obesity seeking bariatric surgery compared with those in behavioral treatment (Modi et al., 2008).

Severe obesity may affect QoL for a number of reasons. For example, severe obesity puts a strain on many physical systems resulting in difficulty with physical tasks owing to shortness of breath, joint pain, lack of energy, and/or reduced mobility, which is associated with decreased QoL (Butitta et al., 2014; Kushner & Foster, 2000; Zeller et al., 2015). Another important aspect of QoL is self-perception, primarily around body esteem for youth with obesity (Butitta et al., 2014; Goldfield et al., 2010) and severe obesity (Isnard et al., 2003). Intrapersonal factors may also contribute to poorer QoL, as child depressive symptoms have been associated with lower QoL in children who are overweight (Janicke et al., 2007) and those with severe obesity (Zeller & Modi, 2006; Zeller, Roehrig, Modi, Daniels, & Inge, 2006). However, other intrapersonal predictors of QoL in adolescents with severe obesity, which may be important targets for intervention to improve QoL, are understudied.

For example, obesity has been linked with poorer executive functioning and impulse control in adolescents (Reinert, Po‘e, & Barkin, 2013), which may be a factor contributing to poorer QoL in this population, given that it appears to be related to poorer QoL in other pediatric populations (Brown & Landgraf, 2010; Sherman, Slick, & Eyrl, 2006). One aspect of impulse control found to be particularly relevant to obesity and eating behaviors is negative urgency, which is described as the tendency to have difficulty with impulse control during negative mood states (Cyders & Smith, 2008). Severe obesity may be both a risk factor for and a result of increased experiences of negative urgency, as it appears that higher body mass index (BMI) is associated with greater levels of negative urgency in adolescents (Delgado-Rico, Rio-Valle, Gonzalez-Jimenez, Campoy, & Verdejo-Garcia, 2012). Negative urgency happens only in the context of negative affect, which itself heightens attentional biases to food cues and increases feelings of hunger (Hepworth, Mogg, Brignell, & Bradley, 2010). Adolescents with severe obesity, particularly those presenting for bariatric surgery, may experience greater negative affect than their peers (Zeller et al., 2006). Research in adults has linked negative urgency with binge eating disorder and food addiction (Becker, Fischer, Smith, & Miller, 2016; Emery, King, Fischer, & Davis, 2013; Fischer, Peterson, & McCarthy, 2013; Fischer, Settles, Collins, Gunn, & Smith, 2012; Pivarunas & Conner, 2015; Wolz, Granero, & Fernandez-Aranda, 2017). However, these associations have not been studied in adolescents, particularly those with severe obesity.

Emotional eating is another important intrapersonal factor that is seen with greater prevalence in adolescents with obesity in treatment for their weight, as opposed to their non-treatment-seeking peers, and is linked to negative affect (Goossens, Braet, Van Vlierberge, & Mels, 2009), negative urgency, and difficulties with impulse control (Jasinska et al., 2012). This suggests that adolescents with obesity who experience emotional eating may have specific difficulties with emotion and behavior regulation, particularly when experiencing negative affect. Negative urgency may weaken the ability to engage in healthier forms of coping in the face of negative affect, and therefore be associated with increased emotional eating.

Food addiction is similar to emotional eating in that it involves eating in the absence of hunger and in response to emotional cues or cravings, but is unique in that it reflects a physical and psychological dependence on food to obtain a positive physiological response. This construct has been noted in adolescents, including those adolescents in treatment for obesity (Meule, Hermann, & Kubler, 2015). Recent research also suggests that higher levels of food addiction in adolescents with obesity is associated with poorer QoL (Tompkins, Laurent, & Brock, 2017). Specifically, food addiction, like other types of addiction, may reduce social interactions owing to embarrassment or guilt, feelings of physical discomfort associated with overeating, and feelings of self-disgust (Smith & Robbins, 2013), which likely adversely affects QoL. These processes are similar for emotional eating, which is also often done in secret and may result in physical feelings of discomfort and shame and therefore associated with poorer QoL (Silva, Pais-Ribeiro, & Cardoso, 2008).

The current study examined a mediation model of adolescent-reported negative urgency, emotional eating, and QoL, hypothesizing that negative urgency would be associated with more emotional eating and food addiction, and that these would in turn be associated with poorer QoL in youth with severe obesity presenting for evaluation for bariatric surgery (see Figure 1 for hypothesized model).

Methods
Procedures
The study was approved by the relevant institutional review board. Signed informed consent was waived, as
all data were gathered in the context of clinical visits. Informed consent was acquired through an information sheet discussed at the clinic visit with participants allowing them to opt out of having their clinical data included in the database. This method was used as the signed consent form and would be the only document linking a name to the database, which would serve only to increase risk of breach of confidentiality.

Adolescents completed self-report measures during their presurgical psychological evaluation before bariatric surgery. These evaluations are scheduled when an adolescent qualifies for bariatric surgery (BMI ≥ 35 with a medical comorbidity or BMI ≥ 40; Nadler, Barefoot, & Qureshi, 2012; Speer, Parekh, Qureshi, & Nadler, 2017). Before the evaluation, the family has had a meeting with the surgeon to determine eligibility, and the psychological evaluation occurs about 1–4 months before potential surgery. The purpose of the evaluation is to determine capacity to consent for surgery and identify any diagnoses or psychosocial difficulties that may decrease likelihood of success following surgery. Approximately 50% of those evaluated go on to receive surgery, with those not going on to surgery either electing not to move forward with the procedure or unable to obtain insurance authorization to move forward. Adolescents come with a parent to the evaluation where they complete an evaluation including self-report measures completed via REDCap (Harris et al., 2009).

Measures

Negative Urgency

Negative urgency was assessed using the 12-item subscale of the UPPS-P (Urgency, Premedication, Perseverance, Sensation Seeking—Positive Urgency) Impulsivity Scale, a measure that provides an indication of difficulty controlling impulses during a negative emotional state (Lynam, Smith, Whiteside, & Cyders, 2006). Adolescents rate statements on a 1 (Disagree Strongly) to 4 (Agree Strongly) scale with higher scores indicating greater difficulties with impulse control in negative mood states. An example item is, “When I feel bad, I will often do things I later regret in order to make myself feel better now.” This measure has established reliability and validity (Anestis, Selby, & Joiner, 2007). In the current sample, there was good internal consistency (α = .89).

Emotional Eating

The three subscales (Depression, Unsettled, and Anger/Anger/Anger/Frustration) of the 27-item Emotional Eating Scale for Children (EES-C) were used as indicators of eating in negative emotional states. This is a measure with established reliability and validity in adolescent populations (Tanofsky-Kraff et al., 2007). On this measure, adolescents rate how strongly they experience a desire to eat from 0 (I have no desire to eat) to 4 (I have a very strong desire to eat) under a number of different emotional states (e.g., furious, nervous, upset). In the current sample, the subscales demonstrated good internal consistency of α = .95 (Depression), α = .96 (Anxiety/Anger/Frustration), and α = .82 (Unsettled).

Food Addiction

The total symptom score from the 25-item Yale Food Addiction Scale for Children (YFAS-C) was used as an indicator of the number of symptoms of food addiction the adolescent experiences (e.g., withdrawal, loss of control, impairment rated as yes/no) and frequency of occurrence (0 = never to 4 = 4 or more times daily). A scoring formula translates the presence/absence and frequency items into scales representing symptoms (e.g., withdrawal, tolerance, clinical significance) and the total score reflects the sum of these subscales to indicate the total number of symptoms of food addiction present. This scale has good demonstrated validity and reliability (Gearhardt, Roberto, Seamans, Corbin, & Brownell, 2013) and displayed good internal consistency in the current sample (α = .91).

Quality of Life

Adolescents completed the Impact of Weight on Quality of Life scale, a well-established measure used with adolescents with obesity (Kolotkin, Head, Hamilton, & Tse, 1995). The 27-item scale asks
individuals to rate statements for how true they are for the respondent on a scale of 1 (Always True) to 5 (Never True). The impact of weight on physical comfort, body esteem, and social life subscales was used for the current analyses. These subscales displayed good internal consistency in the current sample (physical comfort α = .84; body esteem α = .91; social life α = .88).

Data Analytic Plan
All statistical analyses were completed using Mplus Version 6.0 and SPSS Version 24. First, descriptive analyses were conducted to describe the sample. The data were screened for outliers and for indicators that were nonnormal (i.e., skewness > 3, kurtosis > 8). All indicators were within the acceptable ranges, suggesting normal data. Next, the model (see Figure 1) was analyzed using Structural Equation Modeling (SEM). The full information maximum likelihood procedure was used to include participants who had data missing and presumed to be missing at random. Overall model fit was assessed using four different statistics. First, a chi-square analysis was used. The other indices were the Root Mean Square Error of Approximation (RMSEA) (values between 0.05 and 0.08 indicate acceptable fit, and values <0.05 a good fit), Comparative Fit Index (CFI) (values >0.90 indicate reasonable fit, >0.95 good fit), and Standardized Root Mean Square Residual (SRMR) (values <0.10 indicate good fit) (Kline, 2005). The measurement model was first tested to ensure that each of the observed variables was a sufficient indicator of the hypothesized latent variables. Next, the model including the hypothesized pathways was evaluated.

Results
Participants were 69 adolescents aged 13–21 years (M age = 16.5, SD = 1.5). The majority were female (71%) and from ethnic minority backgrounds (76% ethnic minorities). BMI ranged from 35 to 87 kg/m² (M = 50.2 kg/m², SD = 9.0 kg/m²). T-tests were performed for demographic (age, gender), medical (BMI), and predictor and outcome variables to examine any differences between those participants who received surgery and those who did not. There were no significant differences (p > .05) between groups. See Table I for all descriptive information and Table II for correlations among study variables.

Table I presents the means and standard deviations of all the study variables. The measurement model was a good fit for the data (χ²(8) = 8.1, p = .42; CFI = 0.99, RMSEA = 0.02, SRMR = 0.03) and all indicators significantly loaded onto the hypothesized latent variables (p < .001). Specifically, the factor loadings for the Emotional Eating latent variable were β = .97, .96, and .80 for anxiety/anger/frustration, depression, and unsettled subscales, respectively. The factor loadings for the QoL latent variable were also significant with β = .83, .66, and .65 for the body esteem, social functioning, and physical functioning subscales, respectively. The SEM model was a good fit for the data (χ²(18) = 28.7, p = .05; CFI = 0.96, RMSEA = 0.09; SRMR = 0.07; see Figure 2). Negative urgency was significantly associated with more emotional eating (β = .55, p < .001) and more symptoms of food addiction (β = .45, p < .001). More emotional eating was associated with a poorer reported weight-related QoL (β = −.30, p < .01). More food addiction was also associated with poorer weight-related QoL (β = −.61, p < .001). The indirect effects for emotional eating were also significant (β = −.16, p < .05), although the mediation through food addiction explained more of the variance in QoL (β = −.28, p < .001). Overall, the model explained 55% of the variance in QoL (p < .001), 30% of the variance in emotional eating (p < .01), and 20% of the variance in food addiction (p < .05).

Discussion
QoL is significantly impacted in adolescents with severe obesity (Schwimmer et al., 2003) and should be an important target of intervention in this population. Identifying internal psychological processes that are associated with poor QoL allow for avenues of intervention. The current study provides evidence of important contributors to QoL. Specifically, difficulties with controlling impulses during negative mood states (negative urgency) is associated with increased experience of emotional eating and greater number of symptoms of food addiction. Emotional eating and food addiction symptoms mediate the association between negative urgency and lower QoL among adolescents.
with severe obesity. Therefore, negative urgency appears to be particularly relevant to youth with severe obesity as a potential target for intervention that could improve maladaptive eating behaviors, such as eating in response to emotional states or symptoms of food addiction, as well as QoL.

Notably, the current sample of predominantly minority adolescents with severe obesity appears to experience rates of negative urgency comparable with published literature using female college students (Racine & Martin, 2016), so do not appear to be experiencing heightened rates of this mood-specific impulsivity. Similarly, the current sample reported weight-related QoL as comparable with other samples of youth with varying classes of obesity (Kolotkin et al., 1995). However, in the current sample, participants demonstrated symptom counts on the YFAS-C slightly higher than previous samples, which included healthy weight youth in addition to those with varying rates of obesity (Gearhardt et al., 2013). Scores on the EES-C obtained in the current sample were most comparable with youth with reported loss of control eating behaviors (Shomaker et al., 2010). This suggests that the current sample is comparable with other previous healthy young adult samples on negative urgency, but reporting levels of emotional eating and food addiction that may be at higher levels than adolescents at healthy weights or lower classes of obesity or comparable with other at-risk populations.

The current study further supports previous literature indicating an association between negative urgency and emotional eating behaviors in adults (Fischer et al., 2012; Racine et al., 2013; Racine et al., 2015) and impulsivity and dysregulated eating among

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**Table II. Correlations**

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<td>4. Negative urgency</td>
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<td>5. Emotional Eating Scale—Anger, Anxiety, Frustration</td>
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<td>6. Emotional Eating Scale—Depression</td>
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<td>7. Emotional Eating Scale—Unsettled</td>
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<td>8. YFAS—Total</td>
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<td>9. QoL—physical comfort</td>
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<td>10. QoL—body esteem</td>
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<td>–.50**</td>
<td>–.39**</td>
<td>–.46**</td>
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<td>11. QoL—social life</td>
<td>–.33**</td>
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<td>–.26*</td>
<td>–.34**</td>
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Note. YFAS = Yale Food Addiction Scale; QoL = Quality of life; BMI = body mass index.

*p < .05, **p < .001.

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**Figure 2.** Final model.
adolescents with obesity (Gowey et al., 2017), extending these findings to predominantly minority adolescents with severe obesity presenting for bariatric surgery. Although rates of negative urgency were not higher in this population than in healthy young adults, research has demonstrated that obesity is associated with weaker executive function (Reinert et al., 2013) and increased depressive symptoms (Onyike, Crum, Lee, Lyketsos, & Eaton, 2003; Zeller & Modi, 2006; Zeller et al., 2006), which may heighten the frequency of opportunities to experience negative urgency. Therefore, even normative rates of negative urgency present in adolescents with severe obesity may occur with greater frequency and have a larger impact on disease-specific functioning than on healthy weight individuals, given the risk of emotional eating and food addiction as obesogenic behaviors. This suggests that interventions targeting negative affect may also be indicated, as reducing incidences of negative affect might therefore reduce the frequency of negative urgency in adolescents with severe obesity.

Bariatric Surgery
The findings of the current study can also inform the screening and treatment of adolescents undergoing bariatric surgery. Given that bariatric surgery is the only effective treatment for adolescents with severe obesity (Inge et al., 2016), this procedure is likely to increase in frequency, yet much is unknown about predictors of outcomes among adolescents. Current research suggests that presurgical loss of control eating may predict poorer weight loss outcomes in adolescents with severe obesity (Mackey, Olson, Merwin, Wang, & Nadler, 2017) so is an important target of intervention. The current study adds to this literature by highlighting not only weight loss outcomes as important, but also QoL, and identifies potential targets for intervention. The presurgical psychological evaluation provides a unique opportunity to identify the problem areas of negative urgency, emotional eating and food addiction, and treatment could precede or follow surgery as a means to improve QoL independent of weight loss. Specifically, treatment to reduce negative urgency and provide adolescents with additional coping skills outside of eating behaviors to reduce negative mood states could be a useful adjunct to surgical treatment to improve QoL, as these behaviors may not change as a result of surgery and would benefit from additional treatment. Future research should evaluate whether these processes predict weight loss outcomes in addition to QoL.

Clinical Applications
Adolescents with severe obesity who do not go on to receive bariatric surgery may require additional treatment to reduce negative urgency and learning new methods of coping with negative mood states as opposed to engaging in emotional eating. Even in the absence of weight loss, which is notoriously difficult to achieve without surgery in adolescents with severe obesity (Danielsson, Kowalski, Ekblom, & Marcus, 2012), reduction in negative urgency by increasing self-awareness and healthy coping skills in response to negative mood states may have a dual effect of reducing emotional eating and also improving QoL in these vulnerable adolescents. Given that improving executive functioning in general appears to be additionally associated with increased physical activity and nutritional intake (Allan, McMinn, & Daly, 2016; Hall, Fong, Epp, & Elias, 2008), addressing specific aspects of executive functioning, including negative urgency, may have a broad positive impact on the health status and QoL of adolescents with severe obesity. Future research should evaluate whether reducing negative urgency subsequently reduces emotional eating and symptoms of food addiction, and whether this has a meaningful impact on QoL and health status.

Limitations and Future Directions
There are several limitations to the current study. First, the sample size, although diverse, was somewhat small. Second, participants were all adolescents with severe obesity being considered for bariatric surgery, so may not be representative of adolescents with obesity in general, less severe forms of obesity, or those adolescents receiving nonsurgical treatment. Finally, the current study consisted only of cross-sectional data, limiting the ability to address causality or direction of the association of these factors. Future studies should evaluate these relationships prospectively or consider evaluating the effect of interventions aimed at improving negative urgency and reducing emotional eating on improving QoL in adolescents with severe obesity.

Conclusion
In summary, the current study provides additional evidence of the association between negative urgency and emotional eating, demonstrating these links in predominantly minority adolescents with severe obesity presenting for bariatric surgery, who are at risk for poorer executive functioning and increased depressive symptoms. Additionally, findings indicate that these processes contribute to poorer weight-related QoL in this group, providing additional evidence of the importance of targeting negative urgency, negative mood, and coping skills in treatment of youth with severe obesity in interventions.

Conflicts of interest: None declared.
References


