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The association of emotion regulation with lifestyle behaviors in inner-city adolescents

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Abstract

Purpose—Recent research suggests a role of cognitive self-regulation skills on obesity and lifestyle behaviors. However, very little is known about the role of emotion regulation. This study examined the association of emotion regulation with lifestyle behaviors and examined a mediational model testing effects of emotion regulation through self-efficacy and depressive symptoms.

Methods—A cross-sectional study was conducted with 602 adolescents (mean age 12.7 years) from 4 public schools in the Bronx, NY. The sample was 58% female, predominantly Hispanic (74%) and US born (81%). Emotion regulation was assessed by 3 indicators and defined as a latent variable. Dependent variables included fruit/vegetable intake, snack/junk food intake, frequency of physical activity, and time spent in sedentary behaviors. Structural equation modeling examined the association of emotion regulation with lifestyle behaviors, with self-efficacy and depressive symptoms defined as potential mediators.

Results—The analyses showed that there was a positive association of emotion regulation with higher intake of fruits/vegetable and greater physical activity, which was mediated by self-efficacy. Emotion regulation was related to snack/junk food intake and sedentary behavior, and the structural equation model indicated pathways through an inverse relation to depressive symptoms, but these pathways were only observed in adolescent girls and not boys.

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Contributors

Each of the authors listed have contributed to the preparation of the manuscript. Dr. Isasi designed the study, conducted the analyses and drafted the manuscript. Dr. Will contributed to the study design, interpretation of data and preparation of manuscript. Dr. Ostrovsky contributed to interpretation of data and preparation of manuscript. All authors have approved the final manuscript.

Conflict of Interest

All authors declare that they have no conflict of interest to disclose.

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Conclusions—These findings indicate that the ability to regulate emotions among adolescents has a role in weight-related behaviors. Future studies may need to explore the relation of other dimensions of emotion to positive health behaviors and study aspects of emotion regulation that may be more relevant for boys.

Keywords

Adolescents; Lifestyle behaviors; Emotion regulation; Depressive Symptoms; Self-efficacy

1. INTRODUCTION

Self-regulation skills are emerging as important influences for dietary choices and obesity risk in youth. Prior studies indicate that children with higher effortful capacities are more likely to engage in healthier lifestyle behaviors (Gerrits et al., 2010; Riggs, Spruijt-Metz, Chou, & Pentz, 2011; Riggs, Spruijt-Metz, Sakuma, Chou, & Pentz, 2010; Wills, Isasi, Mendoza, & Ainette, 2007). Deficits in effortful control characteristics, such as low delay of gratification and higher impulsivity are shown to be associated with higher risk of obesity and unhealthier lifestyle behaviors (Evans, Fuller-Rowell, & Doan, 2012; Francis & Susman, 2009) (Guerrieri, Nederkoorn, & Jansen, 2008; Isasi & Wills, 2011; Nederkoorn, Houben, Hofmann, Roefs, & Jansen, 2010). However, few studies have examined emotion-related aspects of self-regulation in this context. Findings from several studies showed that the children's capacity to regulate their emotions is an important predictor of mental health and risk behaviors, particularly those that may be related to depressive symptoms (Cheetham, Allen, Yucel, & Lubman, 2010; Southam-Gerow & Kendall, 2002) (Eisenberg, Fabes, Guthrie, & Reiser, 2000; Wills, Pokhrel, Morehouse, & Fenster, 2011; Wills, Walker, Mendoza, & Ainette, 2006).

The purpose of the present study was to examine the role of emotion-regulation in weight-related lifestyle behaviors in a sample of inner-city students. We were also interested in examining whether self-efficacy and depressive symptoms mediated the effect of emotion regulation and behaviors, since these two factors have been related to lifestyle behaviors and have also been associated with self-regulation.

2. METHODS

2.1 Participants

The study enrolled 602 participants in grades 7–8 from 4 public schools in the Bronx, NY. Participants were between the ages of 11 and 16 (mean 12.7, SD = 0.8). The sample was 58% female, 74% Hispanic, 17% African American, and 9% other race/ethnicity; 81% of participants were US born. Participant reported that 6.7% of their mothers had only completed grade school, 14.1% had some high school education, 22.8% had graduated from high school, 12.5% had some college education, 30.6% were college graduates, and 13.3% had obtained a higher-level degree.

2.2 Procedure

The study was approved by the Institutional Review Boards of the Albert Einstein College of Medicine and the New York City Department of Education. Before the start of the data collection letters were mailed to parents informing of the purpose of the study. Parents were instructed to mail back a self-addressed prepaid postcard or to notify a designated school official if they did not want their child to participate in the study. Students signed an assent form if they wished to participate. The participation rate was 82.7%. Reasons for non-participation were parental or student refusals (1% and 7.6%, respectively), letters to parents returned by postal office (1.1%) and student absenteeism (7.6%).

2.3 Measures

2.3.1. Demographics—The questionnaire included questions about participants' age, gender, race/ethnicity, and maternal education.

2.3.2. Emotion regulation—Emotion regulation was assessed with 3 indicators and analyzed as a latent construct. This construct included a scale for soothability (6-items, Chronbach's $\alpha = 0.76$) (Kendall & Williams, 1982); a 5-item scale for sadness management (Chronbach's $\alpha = 0.78$) (Shipman, Zeman, Penza, & Champion, 2000); and a 4-item scale for anger management (Chronbach's $\alpha = .88$) (Shipman et al., 2000).

2.3.3. Self-efficacy for healthy food choices—We used the 9-item scale that assesses self-efficacy to make healthy food choices in social, emotional, and normal situations (Cronbach's $\alpha = .87$) (Neumark-Sztainer, Wall, Perry, & Story, 2003).

2.3.4. Self-efficacy for being physically active—We used a 6-item scale that asked students how sure they were that they can do physical activity in a variety of situations, such as when feeling sad or stressed, or when having a lot of homework (Cronbach's $\alpha = .85$) (Sallis, Pinski, Grossman, Patterson, & Nader, 1988).

2.3.5. Depressive symptoms—We used a 6-item scale for depressive symptoms (Kandel & Davies, 1982), which asks how much students have been bothered by feelings of being too tired to do things or being unhappy, sad or depressed. (Cronbach's $\alpha = .78$).

2.3.6. Dietary assessment—We assessed fruit and vegetable intake and snack and junk foods (e.g. cookies, French fries) with the short version of the Youth/Adolescent Questionnaire (YAQ) (Rockett, Berkey, & Colditz, 2007).

2.3.7. Physical activity—To assess physical activity we used questions from the Youth Risk Behavior Survey (Brener et al., 2002).

2.3.8. Sedentary behavior—We used a sedentary behavior scale that asks about how much time the participant spent doing sedentary activities the most recent day they were not in school (Chronbach's $\alpha = 0.68$) (Norman, Schmid, Sallis, Calfas, & Patrick, 2005).

2.3.9. Height and Weight—Height was measured using a portable stadiometer (Seca Portable Stadiometer 214). Weight was measured using a digital portable scale (Seca Robusta 813). These measures were used to derive a BMI z-score for each participant, using the CDC growth curves for age and sex.

2.4. Statistical Analysis

Analyses included confirmatory factor analysis (CFA) and structural equation model (SEM) with emotion regulation defined as exogenous variable (not predicted by any prior variable in the model) and specified as a latent variable indexed by 3 indicators (soothability, sadness, and anger management). Depressive symptoms and measures of efficacy were specified as endogenous variables (mediators). Food intake, physical activity, and sedentary behavior were defined in the model as criterion variables with correlated residual terms. CFA was conducted using maximum likelihood estimation to test the measurement structure of a model with correlations among the constructs. The measurement model showed a good fit (CFI = 1.00, RMSEA = .00); standardized loadings of indicators on emotion regulation were between .73 and .83. We then conducted a structural equation model (SEM) to test the hypothesized pathways using maximum likelihood estimation with the EM algorithm used

to model missing data. The model was adjusted for gender, ethnicity and maternal education. Effect modification by gender was examined using multiple group analyses in SEM. Nested chi-square tests examined whether differences across gender subgroups were significant. Descriptive analyses were conducted with Stata version 11, while confirmatory analyses and structural equation modeling were conducted with MPlus version 5.

3. RESULTS

The SEM results (Figure 1) showed that emotion regulation had significant positive paths to both measures of self-efficacy, and a significant path from self-efficacy for healthy eating to fruit/vegetable intake producing a significant indirect effect (for indirect effect = 0.04, $p = 0.008$). Similarly, emotion regulation had a positive path to self-efficacy for being physically active, and self-efficacy had a significant path to vigorous physical activity (for indirect effect = 0.10, $p < 0.001$). A significant inverse path from emotion regulation to depressive symptoms, and a path from depressive symptoms to more time spent in sedentary behaviors also resulted in a significant indirect effect (for indirect effect = -0.04 , $p = 0.002$). In addition, there was significant inverse association of emotion regulation with intake of snack and junk food that was mediated by depressive symptoms (for indirect effect = -0.02 , $p = 0.045$).

The model also indicated that intake of snack/junk food significantly increased with age ($\beta = 0.10$, $p < 0.01$). Compared to adolescent boys, girls reported less physical activity ($\beta = -0.21$, $p < 0.001$). Self-efficacy for healthy eating was lower among adolescents with more depressive symptoms ($\beta = 0.13$, $p < 0.01$) while self-efficacy for being physically active was lower among girls ($\beta = -0.16$, $p < 0.001$). Higher levels of depressive symptoms were observed in girls ($\beta = 0.10$, $p < 0.05$) and appeared to decrease with age ($\beta = -0.08$, $p = 0.06$). Girls and Hispanic adolescents had lower scores of emotion regulation ($\beta = -0.17$, $p < 0.001$ and $\beta = -0.18$, $p < 0.001$, respectively). We also examined the association of emotion regulation with BMI z-score, but no association was found.

The multiple-group analysis (Figure 2) showed that the indirect effects of emotion regulation on fruit/vegetable intake and physical activity were similar in boys and girls. However, the association of emotion regulation with snack/junk food and sedentary behavior was significant among girls but not boys. Among girls, there was an inverse association between emotion regulation and depressive symptoms ($\beta = -0.23$, $p < .001$) that was not observed among boys ($\beta = -0.05$, $p = .43$). Among girls, there was direct inverse association of emotion regulation with snack/junk food ($\beta = -0.49$, $p < .01$), but the indirect effects (mediated by depressive symptoms) was not statistically significant (β for indirect = -0.08 , $p = .10$). Among girls, depressive symptoms mediated the association of emotion regulation and sedentary behavior (β for indirect = -0.13 , $p = .002$).

4. DISCUSSION

The study findings suggest a role of emotion regulation in lifestyle behaviors. Adolescents with better ability to regulate their emotions showed higher self-efficacy and healthier lifestyle behaviors (higher intake of fruit/vegetables and more physical activity). Among girls, lower emotion regulation capacities were associated with higher levels of depressive symptoms, which in turn were associated with unhealthier lifestyle patterns (higher intake of snack/junk food and more sedentary behaviors).

More studies have contributed to build the evidence about the role of self-regulation on obesity-related behaviors. However, most of these studies focused on the behavioral aspects of self-regulation such as effortful attentional control and delay of gratification, but few have examined emotion-related regulation (Isasi & Wills, 2011; Riggs et al., 2011; Wills et

al., 2007). Emotional reactivity and emotional eating has been associated to gain weight and obesity in toddlers and adolescent girls, respectively (Graziano, Calkins, & Keane, 2010) (Rehkopf, Laraia, Segal, Braithwaite, & Epel, 2011). However, this association of emotion regulation with obesity was not replicated in our sample. Furthermore, Riggs et al. showed in a couple of studies that executive cognitive function proficiency, which included a subscale for emotion regulation, was inversely related to snack food intake and sedentary behaviors, but the unique effect of emotion-related regulation was not examined (Riggs et al., 2011; Riggs et al., 2010).

The mechanisms explaining the association of emotion regulation and obesogenic behaviors are not clear yet. Better emotion regulation may increase general feelings of efficacy, which could lead, in turn, to healthier behaviors (Wills et al., 2012). Deficits in emotion regulation, on the other hand, may be associated with increased vulnerability to depression (Ehring, Tuschen-Caffier, Schnulle, Fischer, & Gross, 2010; Southam-Gerow & Kendall, 2002; Tortella-Feliu, Balle, & Sese, 2010) and individuals may use food to cope with negative emotions or may engage in sedentary activities (e.g. watching TV), which provide comfort as well. Our findings support this pathway, but only for girls. These gender differences may be explained by how boys and girls respond to emotions. Boys may increase their food intake in response to positive emotions and not to negative emotions. Or other measures of negative affect such as anger or anxiety may be more relevant for boys than depressive symptoms. Future studies need to include a broader range of emotion-related variables for a better understanding of these gender differences.

Another potential explanation of the role of emotion regulation on food intake is that children learnt to use food as a strategy for regulating emotions early in life, when parents use sweets as reward or as a way to manipulate child mood (Blissett, Haycraft, & Farrow, 2010). In this study, we did not assess parental practices related to food, but this is an area that merits attention. The cross-sectional nature of the study poses another limitation as self-regulation is said to operate in a loop, which can only be tested in longitudinal studies. For example, deficits in emotion regulation could influence the development of depressive symptoms, and the occurrence of higher levels of depressive symptoms in turn may decrease individuals' self-regulatory abilities (Baumeister & Alquist, 2009). Further studies incorporating these concepts are needed to gain a better understanding of the relationship between self-regulation and lifestyle behaviors that are related to obesity risk.

Conclusions

This study contributes to the growing self-regulation literature by showing that the ability to regulate emotions is inversely related to unhealthy lifestyle behaviors, and mediated by depressive symptoms. Obesity prevention interventions may need to address emotion-related processes for improving results.

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Highlights

- Few studies address the role of emotion regulation in lifestyle behaviors
- Better emotion regulation was associated healthy lifestyle behaviors
- Self-efficacy mediated the effect of emotion regulation with lifestyle behaviors
- Less emotion regulation was related to depressive symptoms and unhealthy behaviors

Figure 1.

Structural equation model for the association of emotion regulation with mediators and outcome variables (N = 602). Values reported in the figure are standardized coefficients. All coefficients are significant at $p < .05$. The model is adjusted for age, gender, ethnicity and maternal education. The model showed a good fit to the data (Chi-square = 76.69, $df = 39$; N = 602; Comparative Fit Index = .97; Root Mean Square Error of Approximation = .04).

Figure 2.

Multiple-group analysis by gender of the association of emotion regulation with mediators and outcome variables. Values reported are nonstandardized coefficients and their associated standard error (SE). Estimates for girls are reported above the line and below the line for boys.

* Indicates coefficients for subgroups differ ($p < .05$)

**Indicates coefficients for subgroups differ ($p < .01$)