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An open trial targeting emotional eating among adolescents with overweight or obesity

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ABSTRACT

Emotional eating is associated with obesity and disordered eating in adolescents, and thus, is an important target for treatment. We developed a program called PEER (Preventing Emotional Eating Routines), which incorporates emotion regulation skills with behavioral weight loss and parenting techniques for adolescents who are overweight or obese (OW/OB) and their parent. This open label trial evaluated the feasibility, acceptability, and initial efficacy of the PEER program. Thirty adolescents who were OW/OB (86.7% female; mean age = 14.6 years (SD = 1.2); Body Mass Index (BMI) = 34.0 kg/m² (SD = 5.6); 33.3% White non-Hispanic) and their parent (66.7% biological mother) participated in a 4-month treatment and 3-month follow-up. The PEER program was well accepted. Initial efficacy showed significant decreases in emotional eating, and there were trends towards weight loss and a decrease in emotion dysregulation. This trial provides preliminary evidence for the feasibility, acceptability, and initial efficacy of the PEER program among adolescents who are OW/OB and their parent. Further treatment development and randomized controlled studies are needed.

Emotional eating, or eating in response to negative emotional states, has been identified as an “obesogenic” trait that contributes to weight gain and obesity (Crocker, Cooke, & Wardle, 2011). Emotional eating in adolescence is prevalent, as 15–43% of healthy adolescents (Nguyen-Rodriguez, Unger, & Spruijt-Metz, 2009) and 63% of treatment-seeking youth (Shapiro et al., 2007) report emotional eating. According to the Affect Regulation Model, emotional eating is not triggered by the presence of negative emotions, but by the lack of adaptive strategies for managing negative emotional states (Wiser & Telch, 1999). Consequently, adolescents who lack adaptive skills may resort to eating as a way of reducing negative affect. Emotional eating is associated with aberrant and unhealthy eating behaviors, including binge

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eating (Van Strien, Engels, Van Leeuwe, & Snoek, 2005), eating in the absence of hunger (Moens & Braet, 2007), and loss of control eating (Goossens, Braet, Van Vlierberghe, & Mels, 2009). Emotional eating is also associated with disordered eating attitudes and behaviors, such as body dissatisfaction and unhealthy weight control strategies (Stice, Presnell, & Spangler, 2002). Additionally, emotional eating appears to be a predictive factor for the onset of objective binge eating among children and adolescents (Allen, Byrne, La Puma, McLean, & Davis, 2008; Stice et al., 2002).

Given the medical risks, including premature mortality, associated with OW/OB, (Reilly & Kelly, 2011; Strand, Kuh, Shah, Guralnik, & Hardy, 2012), improving treatment for behavioral weight loss is an important goal. Treating emotional eating as part of a behavioral weight loss program may be a promising way to augment behavioral interventions for overweight youth.

Family-based treatment (FBT), the standard behavioral intervention for overweight youth, results in inconsistent outcomes for adolescents (Jelalian et al., 2008). FBT includes nutrition education, physical activity education, and behavior modification strategies for both the adolescent and the parent. On average, adolescents lose 1–4 kilograms of weight at the end of the 16-week intervention (Ernes, Velde, Moreau, Murdoch, & Trussell, 1990; Ikeda, Fujii, Fong, & Hanson, 1982; Mellin, Slinkard, & Irwin Jr, 1987; Wadden et al., 1990) which is statistically significant but with high variability. FBT does not include a strong focus on adaptive strategies for managing emotions for adolescents. Considering that adolescence is a period characterized by significant emotional development and expression (McLaughlin, Hatzenbuehler, Mennin, & Nolen-Hoeksema, 2011), FBT lacks a key component to address an underlying mechanism of overeating.

Dialectical behavior therapy (DBT) is a treatment based on the Affect Regulation Model that was specifically developed to target and improve emotion regulation (Linehan, 1993). DBT was developed to address severe emotion dysregulation among individuals with Borderline Personality Disorder (Linehan et al., 2006), but has recently been applied to binge eating (Safer & Jo, 2010) and bulimia (Safer, Telch, & Agras, 2001), and has been adapted for use in adolescents (Salbach-Andrae, Bohnkamp, Pfeiffer, Lehmkuhl, & Miller, 2008). Studies with OW/OB adults show that a DBT-adapted intervention resulted in improvement in emotional eating (Roosen, Safer, Adler, Cebolla, & Van Strien, 2012). A recent review summarizing outcomes of DBT-adapted interventions for eating disorders concluded that DBT appears to be effective in treating both eating disorder behaviors and mood difficulties (Bankoff, Karpel, Forbes, & Pantalone, 2012).

Given the need for adaptive strategies for emotion regulation during adolescence, and the high rates of emotional eating, improvement in these skills could be a critical missing step for promotion of weight loss in overweight adolescents. To address this gap, we developed the PEER

program (Preventing Emotional Eating Routines), which provides an intervention that targets both emotion regulation and weight-loss skills for adolescents who are OW/OB. The goal of this open label pilot study was to evaluate the feasibility and acceptability of the PEER program with adolescents who are OW/OB and their parent. Our secondary goal was to evaluate the initial efficacy of the PEER program on outcomes including, emotional eating, emotion regulation, binge eating, depression, and Body Mass Index (BMI).

Methods

Participants

Participants were recruited via advertisements and referrals from physicians and mental health professionals. Participants were screened by phone to determine initial eligibility, and then completed an assessment in person in the clinic. Inclusion criteria included: a) 13–17 year-old adolescent with OW/OB (85 – 99% BMI-for-age), b) ability to read English at a minimum of a 6th grade level (both adolescent and parent), c) adolescent and parent willingness to participate in all assessments and a 16-week intervention. Exclusion criteria included: a) current enrollment in a weight management program, b) medical condition that requires physician monitoring to participate in a weight management program, c) medication that can influence weight, d) psychiatric condition that may interfere with treatment participation, e) regular use of compensatory behavior for weight loss (purging) during the past six months, f) current pregnancy, and g) change in psychotropic medication during the previous three months. All inclusion and exclusion criteria were self-reported except BMI.

Ninety-seven adolescents and their parents contacted the center for the study, 53 were invited for assessment, and 30 adolescents and their parents enrolled in the PEER program. No significant differences were found between those who completed the intervention and those who were lost to follow-up. See [Table 1](#) for demographics of the sample.

Measures

Acceptability (adolescent and parent)

An acceptability survey was completed at post-treatment and included questions such as, “How much did you like the PEER program?” (love it, liked it a lot, liked it OK, liked it a little, didn’t like it), “How much did PEER help you and your teen change your lifestyle?” (very much, somewhat, neutral, not very much), and “How much did the PEER program help you change your lifestyle?” (very much, somewhat, neutral, not very much). Similar

Table 1. Characteristics of the full study sample, those who completed and those who were lost to follow-up.

	Full sample (n = 30)	Participants who completed the intervention (n = 21)	Participants who dropped out (n = 9)
Teen BMI Percentile mean (<i>SD</i>)	98.1 (2.2)	98.4 (1.6)	97.4 (3.2)
Teen BMI mean (<i>SD</i>)	34.0 (5.6)	34.6 (6.0)	32.6 (4.2)
Teen mean (<i>SD</i>) age	14.6 (1.2)	14.8 (1.2)	14.2 (1.3)
Teen gender (%)			
Male	13.3 (4)	14.3 (3)	11.1 (1)
Female	86.7 (26)	85.7 (18)	88.9 (8)
Teen ethnicity (%)			
Hispanic	43.3 (13)	28.6 (6)	77.8 (7)
White	33.3 (10)	42.9 (9)	11.1 (1)
Non-Hispanic Mixed	20.0 (6)	23.8 (5)	11.1 (1)
Pacific Islander	3.3 (1)	4.8 (1)	0 (0)
Parent mean BMI	29.8 (7.3)	28.3 (6.6)	33.2 (7.9)
Parent relationship to teen (%)			
Biological mother	66.7 (20)	61.9 (13)	77.8 (7)
Biological father	16.7 (5)	19.0 (4)	11.1 (1)
Adoptive mother	10.0 (3)	9.5 (2)	11.1 (1)
Female guardian	6.7 (2)	9.5 (2)	0 (0)
Family income (%)			
<50k	16.7 (5)	9.5 (2)	33.3 (3)
50–99.9k	33.4 (10)	38.1 (8)	22.2 (2)
>100k	50.0 (15)	52.4 (11)	44.4 (4)

Note. No significant differences were seen between those who dropped out and those who remained on any of the above variables

questionnaires have been used in our other studies (Boutelle, Knatz, Carlson, Bergmann, & Peterson, 2016).

Anthropometry (adolescent and parent; BMI, BMI z-score)

Height and weight were measured in duplicate by trained staff at each assessment and treatment visit. The average of the two values was used for analysis and BMI was calculated ($BMI = [kg/m^2]$). For adolescents, age-adjusted BMI percentile (BMI%) and standardized BMI (BMIz) were calculated. (Kuczmarski et al., 2002)

Emotional Eating Scale (EES-C and EES; adolescent and parent respectively) (Arnow, Kenardy, & Agras, 1995; Tanofsky-Kraff et al., 2007)

The EES is a 25-item, self-report measure that evaluates eating behavior in the context of negative emotions. The EES-C was adapted from the EES to measure emotional eating in 8–17 year-old children. The EES-C has strong internal consistency, good discriminant validity, and good temporal stability for each subscale (Arnow, Kenardy, & Agras, 1995; Tanofsky-Kraff et al., 2007). Cronbach's alpha for both parent and adolescent on the EES subscales ranged from .65-.91.

Difficulties in Emotion Regulation Scale (DERS; adolescent and parent) (Gratz & Roemer, 2004)

The DERS is a 36-item self-report questionnaire that assesses six areas of emotion regulation: lack of emotional awareness, lack of emotional clarity, difficulties controlling impulsive behaviors when distressed, difficulties engaging in goal-directed behavior when distressed, non-acceptance of negative emotional responses, and limited access to effective emotion regulation strategies. The overall total score on the DERS was used as a measure of emotion dysregulation. The DERS has good demonstrated validity and reliability (Gratz & Roemer, 2004). Cronbach's alpha for parent and adolescent on the DERS was .93 and .94 respectively.

Beck Depression Inventory-II (BDI-II; adolescent and parent) (Beck, Steer, & Brown, 1996)

The BDI-II is a 21-item self-report measure of depression that has been used to assess depression in adolescents and adults. Good internal consistency, test-retest reliability, and validity have been reported (Wang & Gorenstein, 2013). Cronbach's alpha for the parent on the BDI-II was .86 and for the adolescent was .90.

The Mini-International Neuropsychiatric Interview (MINI; adolescent) (Sheehan et al., 1998)

The MINI is a reliable and valid semi-structured diagnostic interview with good inter-rater reliability that assesses psychiatric diagnoses based on the DSM-IV. The MINI was used to determine the presence of a severe psychiatric disorder warranting study exclusion.

Demographic characteristics, medical history, and weight history (adolescent and parent)

Items included demographics, eating habits, and family medical history.

Design and procedure

This study was approved by the Institutional Review Board at the University of California, San Diego. Participants who completed an initial phone screen and met inclusion criteria were scheduled for an in-person assessment meeting during which adolescents and their parents provided written informed assent (adolescents) and consent (parents), completed interviews and questionnaires, and had height and weight measured. Following the baseline assessment, participants attended a four-month PEER treatment program, and completed assessments at post-treatment and 3-month follow-up. Graduate students and postdoctoral fellows delivered the treatment, under the supervision of the first author. Participants were compensated \$25 in gift

cards per adolescent/parent pair at post-treatment and 3-month follow-up for time and effort.

PEER treatment components

The PEER program included four main treatment components: DBT to target emotion regulation, FBT for weight loss, behavioral coaching (BC) to encourage adherence to DBT and FBT skills, and Emotion-Focused Parent Training (EFPT; Knatz, Braden, Boutelle, 2015) to provide emotion-focused parenting to support the adolescent. DBT and FBT skills were taught to the parent and adolescent together weekly for 30 minutes, BC was conducted with the adolescent alone weekly for 30 minutes, and EFPT was conducted with the parent alone every other week for 30 minutes (see Table 2 for structure of sessions).

To address negative emotions, specific DBT skills were taught to the adolescent and parent in sessions 1–9. Parents were expected to participate with the adolescent, to model skills usage and use DBT language with their teen to reinforce the skills at home. Skills taught included dialectical abstinence, emotion regulation skills, mindfulness, and distress tolerance. Both adolescent and parent utilized a diary card to track emotions and skills used.

To address healthy eating, physical activity and weight loss, specific FBT skills were taught to the adolescent and parent in sessions 10–16. Adolescents and parents also learned specific behavioral principles of weight loss, including stimulus control, planning ahead, and relapse prevention. During these weeks, the adolescent and parent continued to monitor emotions and skills but also monitored food intake and physical activity on their diary cards.

To encourage compliance and application of skills, BC was conducted with the adolescent alone. In these sessions, the interventionist discussed

Table 2. Treatment components and total time by session.

Session number	Session components			Total time (min)
1	DBT	BC		60
2	DBT	BC	EFPT	90
3	DBT	BC		60
4	DBT	BC	EFPT	90
5	DBT	BC		60
6	DBT	BC	EFPT	90
7	DBT	BC		60
8	DBT	BC	EFPT	90
9	DBT	BC		60
10	FBT	BC	EFPT	90
11	FBT	BC		60
12	FBT	BC	EFPT	90
13	FBT	BC		60
14	FBT	BC	EFPT	90
15	FBT	BC		60
16	FBT	BC	EFPT	90

Table 3. Intent to treat analyses from baseline to post-treatment and baseline to 3-month follow-up on adolescent study outcomes (N = 30).

	Observed Mean (SD)		Change from baseline to 3-month follow-up			Change from baseline to post-treatment			Change baseline to 3-month follow-up		
	Baseline	Post treatment	3-month follow-up	Mean difference (95% CI)	p	Effect size	p	Mean difference (95% CI)	Effect size	p	
BMI	34.2 (5.68)	33.6 (5.72)	33.2 (5.35)	-.62 (-1.14, 1.38)	.11	.142	.17	-.99 (-1.16, 2.16)	.11	.111	
BMI-Z	2.27 (.41)	2.21 (.44)	2.18 (.42)	-.05 (-.01, .11)	.12	.110	.22	-.09 (-.01, .18)	.110	.065	
Emotional Eating Depression	21.00 (7.34)	17.20 (7.69)	18.17 (7.48)	-3.80 (1.28, 6.31)	.52	.002	.39	-2.83 (-.28, 5.95)	.002	.084	
Anxiety/Anger/Frustration	8.87 (3.59)	7.30 (3.70)	7.93 (3.76)	-1.57 (.43, 2.71)	.44	.005	.26	-.93 (-.23, 2.10)	.005	.151	
Unsettled	9.27 (3.24)	7.57 (3.36)	8.03 (3.32)	-1.70 (.64, 2.76)	.52	.001	.38	-1.23 (-.06, 2.53)	.001	.066	
Emotion Dysregulation	90.37 (23.61)	83.17 (26.67)	82.70 (25.82)	-7.20 (-2.35, 16.75)	.30	.196	.32	-7.67 (-1.43, 16.76)	.196	.122	
Depressive Symptoms	17.40 (11.80)	11.27 (10.04)	11.80 (11.16)	-6.13 (1.97, 10.30)	.52	.002	.47	-5.60 (.55, 10.65)	.002	.026	

completed homework, reviewed the diary card in detail to elicit reflection on action, urges and negative emotions, conducted behavior chain analysis on target behaviors, and reviewed skills to be practiced in the upcoming week.

To further encourage emotional regulation, we developed EFPT (Knatz et al., 2015). EFPT was provided to the parent alone and was used to assist the parent in supporting the adolescent in processing emotions, increasing parental emotion self-efficacy, promoting positive parent-adolescent relationship, and reducing the need for dysfunctional emotion regulation behaviors.

Statistical analysis

Treatment acceptability outcomes were assessed using descriptive statistics. Repeated measures ANOVAs were used to investigate changes in outcomes a) from baseline to post-treatment and b) baseline to 3-month follow-up. An intent-to-treat approach was used, with baseline values on outcome scores being carried over for participants who dropped out. Effect sizes were computed but should be interpreted with caution given the potential unreliability of the standard deviations in this small sample.

Results

Feasibility and acceptability

Thirty adolescents and their parents enrolled in the study; 21 completed the intervention (see Table 1). No significant differences were seen between those who were lost to follow-up and those who remained in treatment. Interestingly, when ethnicity was dichotomized as “Hispanic” and “Other ethnicity,” significantly more Hispanic families dropped out (54% Hispanic vs 12% Other; $p = 0.013$) compared to White/Non-Hispanic Mixed/Pacific Islander families.

Eighty-three percent of adolescents who completed the program “liked it OK/a lot/loved it” and 72% of adolescents said that the program helped them change their lifestyle “a lot.” Ninety-four percent of parents who completed the program “liked it OK/a lot/loved it,” 67% said that the program helped them and their adolescent change their lifestyle “a lot” and 100% of parents indicated that the EFPT components should be included again.

Initial efficacy of PEER on study outcomes

Over the course of the study, adolescents reported significant decreases in emotional eating due to depression (Wilks’ Lambda = .66, $F = 7.21$, $p = .003$), anxiety/anger/frustration (Wilks’ Lambda = .70, $F = 6.07$, $p = .006$), and

unsettled feelings (Wilks' Lambda = .63, $F = 8.14$, $p = .002$) at post-treatment and 3-month follow-up (see [Table 3](#)). Significant decreases were seen in depressive symptoms across all time points (Wilks' Lambda = .66, $F = 7.28$, $p = .003$) and emotion dysregulation decreased, but it was not statistically significant (Wilks' Lambda = .86, $F = 2.22$, $p = .13$). On average, over the 7 months of the study, adolescents lost a full BMI point (Wilks' Lambda = .83, $F = 2.60$, $p = .094$) and .09 BMI z-score (Wilks' Lambda = .81, $F = 3.07$, $p = .064$), although neither was significant at the $p < .05$ level. Importantly, data suggests that adolescents continued to lose weight after the program. When only treatment completers were analyzed ($n = 21$), patterns were similar except changes in BMI z-score were significant across all three time points (Baseline = 2.31 (SD = .38), post-treatment = 2.23 (SD = .43), 3-month follow-up = 2.18 (SD = .42); Wilks' Lambda = .68, $F = 4.29$, $p = .030$). No significant differences were found on any parent outcomes, however, directionally the results were similar (data not shown).

Discussion

The purpose of this study was to pilot the use of an intervention specifically developed to target emotion regulation and weight loss in adolescents who are OW/OB and their parents. To date, weight-loss programs for adolescents do not target emotion regulation, which may leave adolescents who emotionally eat without the skills to manage emotions. The PEER program provided skills targeting emotion regulation, weight loss, parent training, and adolescent adherence. Our data suggests that the PEER program could be a promising intervention for emotional eating and weight loss in adolescents.

The first goal of this pilot trial was to evaluate the initial feasibility and acceptability of the PEER program. Overall, adolescents and parents reported a high level of satisfaction with the PEER program. A large percentage of the adolescents and parents reported that they liked the program, and both adolescents and parents reported that the PEER program helped their adolescent change their lifestyle. Parents reported that the emotion-focused parenting program was useful and should be included in the PEER program in the future. However, only 70% of the enrolled families completed the program and more Hispanic families were lost to follow-up compared to families of other ethnicities. Higher attrition rates have been shown for Hispanic adults and youth in other treatment domains (Austin & Wagner, 2010; Boykin, London, & Orcutt, 2016) and future studies will need to determine if this model has differential acceptability rates for different race/ethnicities.

The initial efficacy data suggests that the PEER program was effective in assisting adolescents who completed the program in decreasing emotional eating and weight loss. The adolescents in the PEER program also decreased eating in response to negative emotions. Results showed significant reductions in emotional eating associated with depression, anxiety/anger/frustration, and unsettled feelings and overall depressive symptoms. Decreases in general emotional dysregulation was not statistically significant, and was characterized by a small to medium effect. These results suggest that targeting the intensity and regulation of negative emotions may be beneficial in reducing emotional eating, although further research is needed to confirm these findings.

Adolescents who completed the treatment program showed significant reductions in standardized BMI (BMI z-score). Notably, these adolescents continued to show reductions in their BMI/BMI z-score during the follow-up period, suggesting that targeting these mechanisms may provide a durable intervention for those who complete the protocol. However, because we did not follow the participants for more than three months following treatment, further research is needed to examine the enduring effects of targeting emotional eating.

This study is the first to apply a combined emotion regulation training and weight loss among adolescents with overweight and obesity and their parents. We recruited a sample of adolescents and their parents, and demonstrated feasibility, acceptability and preliminary efficacy in decreasing emotional eating and weight. To date, no program effectively targets both emotion regulation and weight for adolescents specifically. This study also demonstrated the acceptability of the novel EFPT program. However, there are a number of limitations that need to be noted. Most importantly, this study did not include a control group, and we cannot draw conclusions about the efficacy of this model in comparison to a control or current standard of care for adolescents with overweight and obesity. This sample was small, primarily White, highly educated, and predominantly female, which limits the generalizability of our findings. We only collected a 3-month follow-up assessment, and much longer follow-up periods are needed to draw conclusions about the durability of changes in weight and emotion regulation. It is also important to note that only 70% of the enrolled families completed the study, with 50% of the Hispanic families dropping out. This was addressed in this pilot study by using intent-to-treat analyses, but further studies are needed to further examine variables that may be associated with a greater risk of dropout.

Conclusions and future study

PEER is the first program to integrate both emotion regulation and weight loss skills for adolescents and their parents. This open label pilot study showed that PEER had high acceptability and had promising data regarding emotional eating and weight loss. Future studies are clearly needed to compare the PEER program to a control condition with a longer follow-up period, and could potentially provide an efficacious and durable treatment targeting both emotion regulation skills and weight loss.

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