

Body Dissatisfaction in Early Adolescence: The Coactive Roles of Cognitive and Sociocultural Factors

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Abstract The sociocultural influences of the media, friends, and family on body dissatisfaction in young girls are well documented, yet further increasing our comprehension of the coaction of cognitive processes with sociocultural factors is crucial to understanding the dynamic emergence of body dissatisfaction in early adolescence. The current study examined the roles of appearance related messages and expectations from friends and family and selective attention biases in the development of body dissatisfaction. An ethnically and racially diverse sample of girls (72 % Hispanic White, 17.8 % African-American, 8.5 % non-Hispanic White, and 1.7 % Asian-American) between the ages of 9 and 13 ($N = 118$) completed multiple measures of attention, sociocultural attitudes toward weight and shape, and body dissatisfaction. The data from these measures were examined using path analysis. The final model fit well, and demonstrated the coactive effect of selective attention and sociocultural factors on body dissatisfaction. These findings will be instrumental in designing future body dissatisfaction intervention and prevention programs that incorporate cognitive factors, augmenting the existing sociocultural and psycho-educational frameworks.

Keywords Body dissatisfaction · Early adolescence · Attention bias · Sociocultural · Cognitive

Introduction

Early adolescence is a critical developmental period for the establishment of healthy eating behaviors, self-esteem, and positive body image. Body composition transforms markedly, varying how adolescents perceive and experience their bodies (Markey 2010). Continued brain development, changes in neural development, and intense hormonal shifts alter the ways in which adolescents think about and interact with their worlds (Paus et al. 2008). These physical and biological experiences, and adolescents' interpretations of them, have been linked to risky behaviors, poor sexual health outcomes, and body dissatisfaction (Fortenberry 2013).

The substantial psychosocial, cognitive, physical, and biological changes occurring during late childhood and early adolescence underscore the critical importance of this time period for establishing a healthy body image and countering body dissatisfaction (Ata et al. 2007). Body dissatisfaction has wide-reaching detrimental effects on adolescent health outcomes, including decreased self-esteem and engagement in physical activity, and increased risk for depression, tobacco use, clinical eating disorders, and obesity (Paxton et al. 2006). Body and weight concerns reported as early as age five are predictive of body dissatisfaction in later childhood (Davison et al. 2003). Body image concerns continue to intensify from childhood through adolescence (Calzo et al. 2012), with increased exposure to social media (Perloff 2014), to explicit sexual content (Peter and Valkenburg 2014), and to sexual attention, interest, and attraction (Gondoli et al. 2011). Once entrenched, body dissatisfaction and dietary restraint behaviors remain high through later adolescence (Rohde et al. 2015).

The existing research points primarily to the sociocultural pressure for thinness as the largest contributor to body dissatisfaction and disordered eating outcomes in

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younger girls and women (Stice 2002). Although group-level differences in body dissatisfaction across ethnicities have been identified in samples of adult women (Grabe and Hyde 2006), the limited body of research with younger African-American, Hispanic, and White samples yields comparable levels of body dissatisfaction among these groups (Heron et al. 2013). In general, fewer sociocultural and behavioral variables appear to influence male body dissatisfaction as compared to females (Barker and Galambos 2003). Given the pronounced and consistent impact of biological, psychological, and sociocultural drivers of body dissatisfaction in girls, regardless of race and ethnicity, the current study featured an ethnically and racially diverse early adolescent female sample.

Sociocultural Determinants of Body Dissatisfaction in Adolescence

Internalization of the Thin Ideal

The sociocultural model of body dissatisfaction and disordered eating identifies internalization of society's idealization of thinness as the driving force behind body dissatisfaction in women (Striegel-Moore et al. 1986). Thin-ideal internalization is evident from early childhood, with children as young as four and adults consistently rating thin female bodies as more attractive than "normal" bodies (Brown and Slaughter 2011). The initial model, as proposed by Striegel-Moore and colleagues, has since been expanded to include social comparison and self-objectification tendencies as mediators of the relationship between internalization of the thin ideal and body dissatisfaction in women (Fitzsimmons-Craft et al. 2014), and to include body mass index when predicting body dissatisfaction in pre-adolescence (Evans et al. 2013). These mediating constructs take hold early in development, and increase in importance during late childhood and early adolescence, as they are incorporated into girls' identity and self-schemas (Harter 2006). Girls as young as 7-year-old report dieting and weight-change strategies to achieve a thinner physique (Westerberg-Jacobson et al. 2012), and children begin engaging in self-evaluative social comparisons on a similar timescale (Diehl et al. 2011). Temporally, internalization of the thin ideal is thought to precede increases in appearance-related social comparison, which precedes high levels of body dissatisfaction in early adolescence (Rodgers et al. 2015).

Sociocultural Messages

Prior to internalizing the thin ideal, young girls become aware of the sociocultural influences and messages, with levels of awareness predictive of both degrees of internalization and body dissatisfaction (Sands and Wardle 2003). Societal

appearance-related expectations are conveyed through multiple streams critical to the development of positive body image and body dissatisfaction, including the media, friends, and family (Keery et al. 2004). Adolescent reports of the frequency and intensity of these expectations appear stable across adolescence and occur independent of BMI (McCabe and Ricciardelli 2001). The impact and subsequent internalization of family pressures and messages on body dissatisfaction is multi-faceted. Weight teasing by parents and other family members is associated with body dissatisfaction and disordered eating outcomes in adolescence (Neumark-Sztainer et al. 2010) that carry into adulthood (Rodgers et al. 2009). Even when weight and shape-related comments from parents and siblings occur relatively infrequently during youth, their recall has long lasting consequences on disordered eating outcomes (Taylor et al. 2006). Young girls who perceive a thin physique as highly valued by parental figures are significantly more likely to be habitual dieters compared with peers who do not experience similar pressures (Field et al. 2001). Parental disordered eating behavior appears to influence body dissatisfaction levels in overweight adolescent samples (Sinton et al. 2012). While not directly related to body dissatisfaction, the atmosphere, priority, and frequency of family meals, coupled with the family dynamic that is created at mealtimes, is predictive of bingeing, purging, dietary restraint, and extreme weight control behavior in adolescent girls (Skeer and Ballard 2013). Improving these aspects of family meals has been suggested as a protection against disordered eating (Neumark-Sztainer et al. 2004). The adolescents' perception of her family meal environment is an important addition to an expanded sociocultural model, as positive family meal environments are also considered a useful mechanism to bolster positive developmental outcomes in adolescence, including self-esteem and self-worth (Fulkerson et al. 2006), other correlates to body dissatisfaction (Tiggemann 2005).

Internalization of the conversations, feedback, and teasing delivered by peers has similar consequences as comments from family. Frequency of appearance based conversations and peer appearance criticism is predictive of body dissatisfaction, and its effect is mediated by internalization of the thin ideal (Lawler and Nixon 2011), as with when the feedback and expectations are delivered from family. This internalized feedback is thought to be more detrimental to girls' body image as compared with boys of a similar age (Phares et al. 2004), with comments from mothers and close same-sex friends predicting body-change strategies in adolescent girls (McCabe and Ricciardelli 2003). Moreover, frequency of weight loss discussions with peers, paired with elevated BMI, is uniquely predictive of body dissatisfaction in this population (Vincent and McCabe 2000). Peer conversations about appearance and

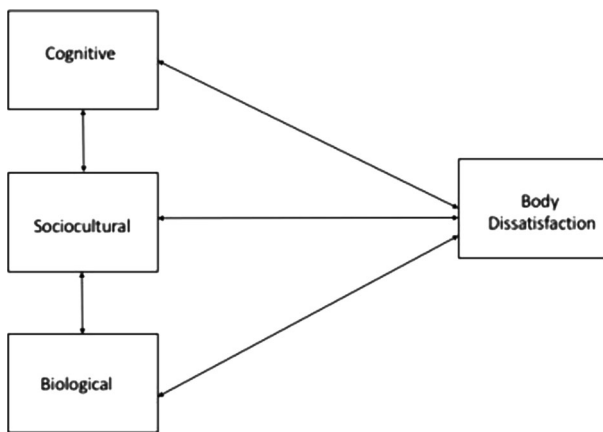


Fig. 1 Conceptual model to better understand body dissatisfaction in early adolescence

weight loss, especially within mixed-gender friendships (Gondoli et al. 2011), link the effect of appearance based media exposure to body dissatisfaction outcomes in late childhood and early adolescence (Clark and Tiggemann 2006), with young girls' perception of body dissatisfaction norms within their peer group also predicting individual levels of body dissatisfaction (Dohnt and Tiggemann 2005).

Beyond the Sociocultural Model: The Role of Cognitive Factors in Early Adolescence

The existing body of work on the sociocultural risk factors has highlighted important environmental elements that contribute to body dissatisfaction. However, taking an overly focused lens to the pressure for thinness espoused by family, peers, and the media discounts the biological and cognitive processes that are likely to coact with these detrimental sociocultural influences, ultimately cascading into body dissatisfaction and disordered eating outcomes. The effects of contextual factors on body dissatisfaction depend on social-cognitive processes that shape how individuals process environmental input (Corning et al. 2006). Frequent exposure to unrealistically thin bodies via the media and to unrealistic appearance expectations from peers and family is thought to differentially impact individuals who exhibit certain cognitive styles, leaving these girls more susceptible to body dissatisfaction (Rodgers and Dubois 2016). In order to more fully comprehend the etiology of body dissatisfaction in early adolescence, the sociocultural, biological, and cognitive factors need to be examined in tandem, integrated into a more comprehensive model. These factors have been successfully integrated into an ecological framework to better explain and identify points of intervention in childhood obesity (Davison and Birch 2001). Such a relational, cognitive-sociocultural model (see Fig. 1) simultaneously delineates how critical pathways within

multiple aspects of the individual (i.e., cognitive and behavioral) are related to multiple levels of ecology (i.e., biological along with sociocultural; Lerner et al. 2013) in an effort to better understand the emergence and maintenance of body dissatisfaction, and to better identify points of prevention and intervention before body dissatisfaction becomes entrenched.

Attention and Appearance Schemas

The multi-layered aspects of the individual and her social and behavioral ecology are bi-directionally shaped through the development of self-regulation capabilities (Lerner et al. 2011). Attention has been highlighted as the “lynchpin of self-regulation” (Geldhof et al. 2010, p. 122), and is thus critical in ensuring positive developmental outcomes. Attention processes determine how an individual allocates and focuses cognitive resources about one's environment and body, shaping both her context and behavior over time (Gestsdottir and Lerner 2008). These processes are influenced reciprocally by self-schemas (Frazier and Hooker 2006). Individuals allocate more attention to aspects of oneself and environment that are considered most self-relevant, thus reinforcing the importance of these domains. In particular, appearance schemas channel attention toward appearance-relevant information (Altabe and Thompson 1996), and have a cumulative, detrimental effect on body satisfaction over time (Hargreaves and Tiggemann 2002), leading one to over-value weight, shape, and appearance. According to Cash (2002), appearance schemas form through an interaction between individual personality characteristics and the accumulation of cultural and interpersonal events. Appearance schemas form early in development, and are associated with perceived pressure for thinness from friends, family, and the media (Sinton and Birch 2006). Appearance schemas mediate the relationship between media exposure and peer appearance-related discussions and body dissatisfaction (Clark and Tiggemann 2007). Hargreaves and Tiggemann (2002) found that adolescent girls with high levels of appearance schematicity report higher levels of body dissatisfaction in late adolescence, compared to boys and girls expressing lower levels of appearance schematicity. These girls were likely reinforcing their appearance schemas by selectively attending to aspects of their environment related to weight, size, and body shape. Overvaluation of weight and shape is common in overweight youth with and without loss of control eating episodes (Goldschmidt et al. 2011).

Attention and Attention Bias to Body-Related Stimuli

Despite the implication of attention processes in the formation and reinforcement of appearance schemas and other

positive and maladaptive developmental outcomes, attention processes have not been directly incorporated into theoretical and methodological attempts to explain body dissatisfaction in early adolescence to date. However, attention biases, characterized by the tendency to over-attend and give priority to potentially threatening or emotionally salient information (Bar-Haim et al. 2007), are featured in the cognitive-behavioral theory of eating disorders (Williamson et al. 2004). Attention biases are the most heavily researched of the cognitive biases associated with body dissatisfaction in adult samples (Rodgers and Dubois 2016). Research with adult and clinical eating disorder populations indicates a strong relationship between the role of attentional bias toward body and shape-related words (Engel et al. 2006) and images (Gao et al. 2013) and the intractability of poor body image and weight dissatisfaction. Environmental and societal stressors, along with cognitive and perceptual influences, likely lead an individual to over-attend to weight and shape, producing these attention biases (Aspenet al. 2013). Therefore, the attention-bias framework is also relevant for exploring the underpinnings of early body dissatisfaction.

The two components of attention bias which are likely linked to body dissatisfaction are selective attention and sustained attention. Selective attention, the ability to filter extraneous information and keep one's focus on the relevant information, operates in tandem with sustained attention, the ability to focus on one stimulus at a time (McKay et al. 1994). Within the attention-bias framework, selective attention, or attentional orienting, refers to the relative efficiency or speed with which attention is drawn to a disturbance-relevant stimulus. Disengagement difficulty concerns impairment in moving attention away from the emotionally salient stimulus, and is captured through the construct of sustained attention (Cisler and Koster 2011).

Attention biases are frequently quantified using the dot-probe paradigm, originally proposed by MacLeod and colleagues (1986). Participants view a short stimulus display of both emotionally salient and neutral items in several spatial locations. The stimuli then disappear and are replaced by a probe in one of the prior stimulus locations. Participants indicate which of the two stimuli the probing item replaced. Attention biases are implied by judging the overall response times toward probes that replaced the emotionally salient stimuli (i.e., congruent trials) compared to probes that replaced neutral stimuli (i.e., incongruent trials), with the expectation of shorter response times for probes replacing the emotionally salient stimuli, or faster shifting of attention toward saliency. More recently, it has been argued that attention biases as demonstrated by the dot-probe paradigm are a result of difficulty disengaging attention from the emotionally salient stimuli rather than faster shifting of attention (Cisler et al. 2009).

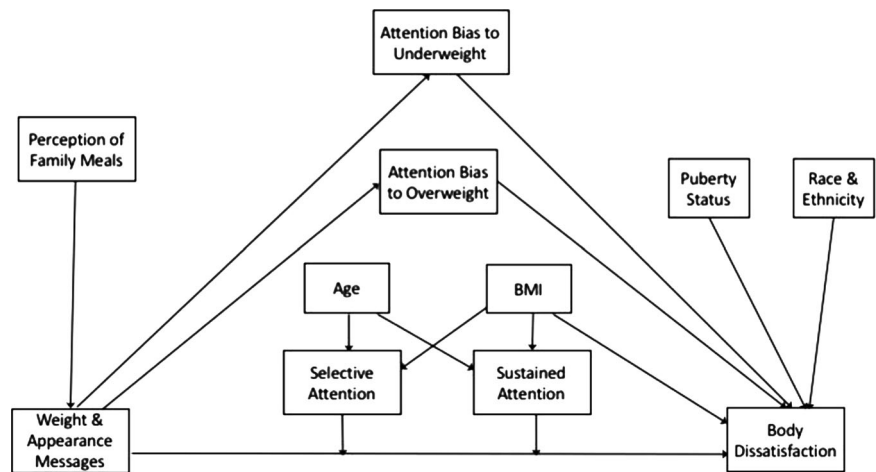
Attention biases toward food and body-related stimuli have been identified among weight and body dissatisfied women (Gao et al. 2013; but see Glauert et al. 2010), women diagnosed with clinical eating disorders (Shafran et al. 2007), and women with nonclinical binge eating episodes (Lyu et al. 2016). The existing literature demonstrates attention biases to both fat and thin silhouettes (Gao et al. 2014) or to only unrealistically thin bodies (Cho and Lee 2013) among body dissatisfied women. Excessive allocation of attention to overweight bodies is likely associated with fear of fatness (Williamson et al. 2004), whereas attention paid to thin or underweight targets mirrors one's desired physical appearance and tendency to seek out upward appearance-related social comparisons in the natural environment (Rodgers and Dubois 2016). One of the few prior studies on body dissatisfaction attention biases in late adolescence compared the visual scanning patterns of teenagers with anorexia nervosa to those without eating disorder symptoms (Pinhas et al. 2014). These researchers found significantly different visual scanning patterns between the clinical and control group, with the control group spending equal time looking at both fat and thin bodies.

In spite of the clear developmental implications, no study to date has examined attention biases to body-related stimuli in late childhood and early adolescence. Likewise, the environmental and sociocultural factors that both exacerbate attention biases and attenuate body dissatisfaction during this critical developmental period remain unidentified. As the cognitive processes involved in the creation and maintenance of attention biases become more efficient during this developmental period (Betts et al. 2006), and body dissatisfaction increases throughout the teenage years (Bearman et al. 2006), early adolescence is a critical transitional time to explore the interrelations among these cognitive and sociocultural factors.

Current Study

The existing evidence overwhelmingly supports the contributions of sociocultural factors to body dissatisfaction, and the presence of an attention bias to emotionally salient stimuli in body dissatisfied adults. There is a substantial gap in the current literature, with very little emphasis on the coactive role of cognitive and sociocultural factors on the emergence of body dissatisfaction in early adolescence. The current study fills this extant gap, by proposing an expanded cognitive-sociocultural model. Building on and expanding the established bodies of literature concerning the effects of weight-related messages from friends and family and appearance schemas on body dissatisfaction in early adolescence, we constructed the model depicted in Fig. 2.

Fig. 2 Proposed path model to assess cognitive and sociocultural contributors to body dissatisfaction



We incorporated both basic and applied attention measures into the existing sociocultural framework, aiming to better explain both how the appearance focused messages relate to body dissatisfaction and which girls are particularly vulnerable to the effects of peer and family expectations and comments. Within the model, we expected attention bias to both feared (overweight) and desired (low weight) bodies would be related to body dissatisfaction levels. Greater biases to the emotionally salient stimuli, as demonstrated by faster reaction times, would be associated with higher levels of body dissatisfaction. These attention biases provide a cognitive link to help explain the effect of the appearance related messages received from friends and family on body dissatisfaction.

We also anticipated that the relationship linking feedback from friends and family to body dissatisfaction would be attenuated by selective and sustained attention skills, demonstrating how attention biases function in an ecologically valid setting. Examining basic attention skills outside of the dot-probe paradigm will help to tease apart whether body dissatisfaction attention biases are driven predominantly by selective or sustained attention processes. We anticipated that individuals with stronger selective (faster reaction times) and sustained (fewer errors) attention skills would experience greater impact from these messages. These cognitive skills would lead to faster orienting to and greater focus on (selective attention) as well as greater difficulty disengaging from (sustained attention) these messages.

The hypothesized model included BMI, demographic variables (age, race, and ethnicity), pubertal status, and the child's perception of her family meal environment as covariates. Prior to assessing model fit, we examined group-level differences on the relevant predictor and outcome measures by demographics, weight, and pubertal status. Given prior findings regarding the relationship between BMI, pubertal status, and body dissatisfaction

(see Tiggemann 2005) as well as BMI and executive function (see Reinert et al. 2013), we controlled for the effect of BMI on body dissatisfaction, and sustained and selective attention. As both attention skills and body dissatisfaction are known to increase slightly through early adolescence, we controlled for the effect of age on these constructs, and because the prior research on racial and ethnic differences in body dissatisfaction is limited, race and ethnicity were included as covariates of body dissatisfaction. Perception of family meal environment was included as a covariate to account for additional messages or environmental factors that might be indirectly contributing to body dissatisfaction outcomes. We expected the final model would fit the data well, highlighting the interplay among sociocultural and cognitive risk factors for body dissatisfaction.

Method

Participants

The final sample for the current study consisted of 118 girls between the ages of nine to 13, with a mean age of 11.46 ($SD = 1.3$), coming from diverse ethnic and racial backgrounds. Based on parent report of demographic information, 72 % of the sample identified as Hispanic, 17.8 % as African-American, 8.5 % as non-Hispanic White, and 1.7 % as Asian-American. These demographics align closely with those recently recorded in the geographic region where this study was conducted. Parent report of height and weight was obtained at time of consent and used by the authors to calculate BMI, using the standard formula ($\text{weight in lbs} \times 703 / (\text{height in inches})^2$). In cases where parent report was unavailable, we relied on adolescent report. Based on sex and age-adjusted norms established by the Centers for Disease Control (2015), 75.4 % ($N = 89$) of the sample were

of a healthy weight, 21.2 % ($N = 25$) were overweight, 2.5 % ($N = 3$) were underweight, and 0.8 % ($N = 1$) were obese. The BMI of the sample ranged from 15.0 to 30.2 ($M = 19.97$, $SD = 2.62$). Forty-four percent of the sample ($N = 52$) was post-menarche. For the current study, participants met inclusion criteria if they had no prior history of attention deficit hyperactivity disorder or an eating disorder, and if they read and spoke English, to ensure comprehension of the assessment instructions and scales. Of the 132 children within the correct age range with written parental consent, six participants refused to finish all of the required assessments and had greater than 10 % missing data points, and six were not proficient in English, resulting in the final sample size of 118 participants.

Procedure

Subsequent to approval from the Institutional Review Board and the establishment of research collaborations with South Florida community summer and after-school programs, the program staff at one of 12 enrichment programs distributed study materials in both Spanish and English to the parents or guardians of children within the appropriate age range. Parents received a letter describing the study procedure and research goals, a consent form, and a background questionnaire requesting demographic information and the child's last recorded height and weight. These materials were distributed in both languages to ensure comprehension of the requirements, risks, and possible benefits of the study. Data collection sessions were all conducted by the first author, and took place on site at the after-school or summer program. Participants provided written assent and completed all study measures in one session, averaging 45-min in length. Participants were informed that the study involved answering some questions about their feelings toward their body and completing some game-like tasks on the computer in order to find out more about how girls feel about their bodies and what they pay attention to.

Measures

Selective Attention

An abbreviated adaptation of the original Eriksen flanker task (Eriksen and Schultz 1979) was administered using Psychology Experiment Building Language, an open-source software designed specifically for computer-based psychology research (PEBL 0.14; Mueller and Piper 2014). This 24 trial task required the participant to focus on a given stimulus while inhibiting attention to stimuli surrounding, or “flanking,” the central stimulus. Children viewed a black screen with white arrows, and were asked to indicate the direction of the central arrow by pressing the shift key that

corresponded with the side toward which the stimulus was pointing. The middle arrow either pointed in the same direction as the “flankers” (congruent trials) and or in the opposite direction (incongruent trials). Trials timed out after 1000 milliseconds (ms). Faster responses on the incongruent trials, controlling for accuracy, indicated higher levels of selective attention.

Sustained Attention

Participants completed a Go/No-Go task, a continuous performance task established by Posner (1980) and modified by Bezdjian and colleagues (2009), as a measure of sustained attention abilities. Children first viewed a black and white array with four stars. A single letter (P or R) appeared in place of one of the stars for a trial duration of 500 ms with an inter-stimulus interval (ISI) of 1500 ms. Participants were instructed to press the right shift key when the target letter (P) appeared, and withhold any response to the distracting letter (R). The task consisted of 160 trials, with an 80:20 ratio of target to nontarget responses. The percentage of correct rejections (inhibiting response to R) served as a measure of sustained attention.

Body Dissatisfaction Attention Bias

For this study, a Body Dissatisfaction Dot-Probe task was developed to assess attention bias in early adolescent girls. This assessment was designed, programmed, and conducted using E-Prime software, and consisted of 200 trials presented on a 15.6" laptop screen. At the start of each trial, a black fixation cross was displayed for 500 ms to center visual attention. Participants were then presented with a pair of images of the same body altered to be at different BMI norms, also for 500 ms. The trial lengths were based on the dot-probe task adapted for children with anxiety by Bechor and colleagues (2014). The images of female children's bodies were located on both the left and the right sides of the screen. The size of one of the bodies depicted was in the middle/healthy range of the established BMI norms for children, and the other body size (the emotionally salient stimulus) fell at one of the extreme ends of the BMI spectrum (i.e., either underweight or overweight). The body stimuli have been validated for accuracy in measuring body dissatisfaction [Children's Body Image Scale (CBIS); Truby and Paxton 2008]. The combinations of stimuli pairs were counterbalanced within participants by size and side, with 40 trials of each combination. Each trial type was presented by the software in a random order across participants (see Fig. 3 for a neutral- high BMI trial example).

Exposure to the body pairs was followed by the display of the probing arrow item in the space that previously contained either the right or left body. Participants were

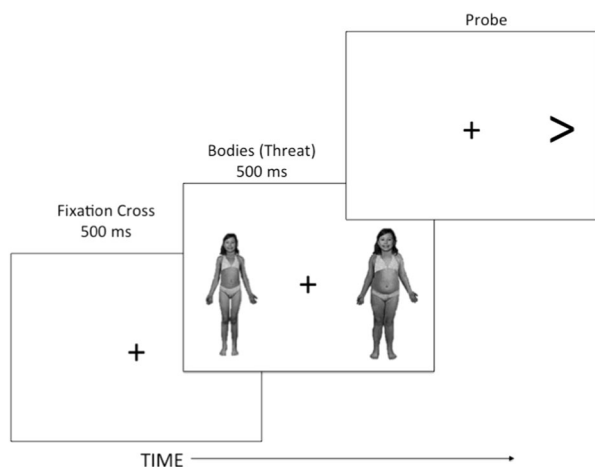


Fig. 3 Example of body dissatisfaction dot-probe trial

instructed to indicate the direction of the arrow with a button press on either the left or right side of the keyboard. Children responded by pressing either the “s” or “l” keyboard press; the letters were obscured by colored stickers to remind participants of the correct key press options. The probe disappeared once the participant responded and the next trial commenced. Reaction time (RT) is the main variable of interest in the dot-probe paradigm. Trials in which the participant’s response was delayed by more than 1500 ms or faster than 100 ms were removed (Bradley et al. 1997). Scores were averaged across trials of similar type. RT on the incongruent trials (in which the probe replaces the healthy body) were subtracted from the congruent trials (in which the probe replaces the emotionally salient/overweight or underweight body) and used to compute separate measures of attention bias to both underweight and overweight bodies, with smaller values (faster RT) representing a greater attention bias.

Perception of Family Meal Environment

The early adolescent’s perception of family meal environment was quantified by Neumark-Sztainer and colleagues (2004) adaptation of the Family Eating Attitude and Behavior Scale (Hogen 1988) for children and adolescents. This scale consists of 14 items that assess priority of and atmosphere (e.g., “in my family, mealtime is a time for talking with other family members”), structure (e.g., “in my family, different schedules make it hard to eat meals together on a regular basis”), and rules (e.g., “in my family, it is OK for a child to make something else to eat if he/she doesn’t like the food being served”) at family meals. The items are answered on a 4-point Likert scale ranging from “strongly agree” to “strongly disagree,” with several items reverse coded, such that higher scores are indicative of a more positive and structured family meal environment.

Responses are summed, with total possible scores ranging from 14–64. In prior research (Neumark-Sztainer et al. 2004), this scale demonstrated adequate test-retest reliability and internal consistency; the Cronbach’s α for the current sample was .78.

Body Dissatisfaction (Real/Ideal Discrepancy)

The CBIS (Truby and Paxton 2002) was completed as an index of body dissatisfaction. Participants were presented with seven gender-matched images of children, ranging in size from very thin to obese. Each child was asked to select the image that corresponded to her own perceived size and the image that most closely matched the shape that she would ideally like to be, with the degree of incongruence between these shapes serving as a measure of body dissatisfaction (Truby and Paxton 2002). Possible scores ranged from zero to six, as we measured the magnitude of the discrepancy as first recommended by Jacobi and Cash (1994). The seven images are based on body mass index population norms in the United States and Europe, as reported in 2000 and updated in 2008 (Truby and Paxton 2008). The CBIS has demonstrated adequate test-retest reliability and is a strong nonverbal method of quantifying differences in current as compared to ideal self-image (Hill 2011).

Perception of Weight-Related Messages

Items from the Body Shape Questionnaire (Mciza et al. 2005) were adapted to form a developmentally-appropriate measure of interpersonal messages and expectations regarding appearance, shape, and weight. To create an index of weight-related messages, each participant responded yes or no to recalling comments regarding her shape, weight, and appearance from both friends and family (e.g., “have your friends ever told you that you are fat?”), and rated the extent of the difference in what friends and family want her to look like compared with what she actually looks like. Participants chose one of eight silhouettes to represent not only her perceived actual appearance, but also what her friends and family would most want her to look like. The discrepancy between these silhouette choices and her actual appearance, along with the number of “yes” responses to the comments from friends and family were summed to create a composite score. Possible total scores ranged from 0–18, with higher scores reflective of more external weight-related pressures and greater perceived discrepancies.

Demographics

Parents reported their child’s race, ethnicity, date of birth, and last recorded height and weight at the time of consent.

The authors calculated participant age from the reported date of birth. Height and weight were subsequently used by the authors to calculate participant BMI and classify participants using the Centers for Disease Control guidelines (2015). While completing the body dissatisfaction and sociocultural measures, girls were also asked to report whether they had yet experienced a menstrual cycle or period. This question served as a proxy for pubertal status.

Analytic Strategy and Data Screening

Descriptive and preliminary analyses were conducted using SPSS 23.0, and the subsequent path analysis was conducted using AMOS 21.0. Data were first evaluated for missingness, skewness, kurtosis, and the presence of univariate or multivariate outliers. Maximum likelihood (ML) multiple imputation was invoked to address missing data patterns of less than 10 % on all predictors and covariates, with ten imputations calculated and pooled to form the final data set. Following the recommendation of Enders et al. (2014), mean centered interaction terms were calculated following imputation. The data were evaluated for univariate outliers by screening for data points outside of the interquartile range, and for multivariate outliers by examining leverage indices for each individual and defining an outlier as a leverage score four times greater than the centered mean leverage value. Four participants were thus identified as multivariate outliers. As a result of these screening measures, the subsequent analyses were conducted with a sample of 118 participants. Data from the attention-bias measures were positively skewed, with a skewness value of 2.13, and Mardia's test was statistically significant, indicating multivariate non-normality. Therefore, all subsequent analyses were conducted with a bootstrapped re-sampling method to correct for non-normality. Indirect model effects were examined using the joint-significance paradigm. This method was chosen as it both minimizes Type I error rates and maximizes statistical power (MacKinnon et al. 2002). Within this framework, the indirect effect is significant if the corresponding 95 % confidence interval (CI) does not contain zero. Once path estimates were obtained, RMediation software (Tofghi and MacKinnon 2011) was invoked to compute the estimates of indirect effects.

Results

Descriptive Statistics

The descriptive statistics for predictor and outcome variables appear in Table 1, and the correlations between variables appear in Table 2. The correlations obtained supported the proposed model. Notably, scores on the

Table 1 Descriptive statistics for all measures to be included in the proposed model

Measure	Min	Max	Mean	SD
Perception of family meal environment	28	54	41.85	4.9
Body dissatisfaction real/ideal difference	0	5	1.1	1.2
Weight and appearance messages	0	8	4.1	1.8
Underweight attention bias	-181.29	852.09	59.51	130.96
Overweight attention bias	-553.83	484.81	-26.75	132.70
Flanker-selective attention	-156.75	203.33	60.1195	59.77
Go/No-Go sustained attention	.08	.97	.44	.20

attention bias to underweight bodies measure were significantly correlated with all of the sociocultural and body dissatisfaction measures. The values in Table 1 were used to compute the mean centered interaction terms for the moderated effects featured within the proposed path analysis model. In the current sample, 31.7 % of girls reported experiencing moderate or extreme dissatisfaction (corresponding to discrepancies greater than 2), matching prior findings with early adolescents (Bearman et al. 2006). On average, participants demonstrated a stronger attention bias to the overweight ($M = -26.75$, $SD = 132.70$) compared to the underweight bodies ($M = 59.51$, $SD = 130.96$).

Preliminary Group-Level Inferential Analyses

We conducted several sets of inferential analyses to examine the racial, ethnic, age, weight, or pubertal status group differences on the various predictors and body dissatisfaction outcome measures. No group mean level differences were found across racial and ethnic groups on the sociocultural and body dissatisfaction measures among non-Hispanic White, Hispanic White, African-American, and Asian identifying participants (see Table 3). Moreover, no group mean level differences were found on these measures between girls who were either pre-menarche or post-menarche (see Table 4). Selective attention scores represent the only predictor or outcome measure to vary significantly by age, $F(4, 117) = 3.478$, $p < .01$; a series of post hoc Bonferroni comparisons indicate that the only significant age group difference was between nine and 13-year-olds (mean difference = 46.6, $p < .017$). Table 5 presents the associated F -values for all measures by age. Lastly, given the prior associations found between BMI and both cognitive and body dissatisfaction measures, group differences between individuals with a healthy BMI compared with those with an overweight BMI were evaluated.

Table 2 Correlations among elements in proposed model

	Perception of family meal environment	Body dissatisfaction	External weight messages	Underweight attention bias	Overweight attention bias	Flanker-selective attention	Go/No-Go sustained attention
Perception of family meal environment	1						
Body dissatisfaction real/ideal difference	.05	1					
External weight messages	-.263**	-.081	1				
Underweight attention bias	.257**	-.232**	-.19*	1			
Overweight attention bias	-.135	-.187**	.07	.1	1		
Flanker-selective attention	-.062	.01	-.05	.102	-.013	1	
Go/No-Go sustained attention	.144	-.02	.181*	.03	-.016	.34**	1
BMI	-.118	.385**	.1	-.136	-.03	.09	.012

Note Greater selective attention, greater attention bias to emotionally salient stimuli, and fewer weight and appearance related messages will be indicated by smaller values. When controlling for body dissatisfaction, the attention-bias measures are significantly correlated, $r = .230^*$

* $p < .05$; ** $p < .01$

Table 3 Comparisons of mean scores on sociocultural and body dissatisfaction measures by race and ethnicity

Measure	F statistic	p-value
Perception of family meal environment	.605	.613
Body dissatisfaction real/ideal difference	.709	.549
Weight and appearance messages	.325	.807

Note For each test statistic, the degrees of freedom equal (3, 117)

Table 4 Comparisons of mean scores on sociocultural and body dissatisfaction measures by menarche status

Measure	t statistic	p-value
Perception of family meal environment	.737	.463
Body dissatisfaction real/ideal difference	.045	.964
Weight and appearance messages	-1.456	.148

Note For each test statistic, the degrees of freedom equal (116)

Table 5 Comparisons of mean scores on all predictor and outcome variables by age and weight category

Measure	Comparison by age		Comparison by weight	
	F statistic	p-value	t statistic	p-value
Perception of family meal environment	.159	.959	2.258	.026*
Body dissatisfaction real/ideal difference	1.067	.376	-3.952	.001**
Weight and appearance messages	.488	.745	-1.046	.298
Underweight attention bias	2.088	.087	1.791	.078
Overweight attention bias	.499	.736	1.418	.159
Flanker-selective attention	3.478	.01**	-.542	.589
Go/No-Go sustained attention	1.006	.408	-.02	.989

Note For each F-value, the degrees of freedom equal (4, 117); for each t-value, the degrees of freedom equal (113)

* $p < .05$; ** $p < .01$

Participants classified with an underweight or obese BMI were not included in these analyses of group differences because they were so few in number. Significant group differences were found in perception of family meal environment scores, $t(113) = 2.258, p < .026$, indicating that normal-weight participants viewed their family meal environment more positively. Additionally, based on the real/ideal body discrepancy measure, the overweight group showed greater body dissatisfaction than the healthy weight group, $t(113) = -3.952, p < .001$. The t-values for all measures between BMI groups also appear in Table 5. Based on these preliminary analyses, race, ethnicity, and pubertal status were included in the path model as non-

significant covariates, while age and BMI were included as significant covariates.

Pathways Within the Cognitive-Sociocultural Model

The fit of the model in Fig. 2 was evaluated using 1000 bootstrapped samples. The model fit was marginal, with a Root Mean Square Error of Approximation (RMSEA) of .06 with $p < .325$, Comparative Fit Index (CFI) of .50, and significant Bollen–Stine χ^2 value ($p < .001$). A modification index [$\Delta\chi^2(1) = 11.158$] was provided suggesting the addition of paths from perception of family meals to attention bias to the underweight body. Upon adding this path, our final model demonstrated good model fit with fit statistics of a non-significant Bollen–Stine χ^2 value ($p < .195$), RMSEA of .038 ($p < .673$), and CFI of .89. Inspection of the residuals revealed no statistically significant points of ill-fit in the model and no theoretically meaningful modification indices were provided. Figure 4 presents relevant standardized parameter estimates, with the unstandardized estimates appearing in parentheses. Non-significant covariates are not pictured.

Role of Attention Bias

As hypothesized, the paths connecting the perception of appearance related messages from friends and family and attention bias toward underweight bodies [$\beta = -.196$, 95 % CI (-.368, -.063), $p < .005$] and connecting attention bias toward underweight bodies with body dissatisfaction [$\beta = -.223$, 95 % CI (.152, .466), $p < .002$] were significant, providing a cognitive link to better capture the relationship between the internalization of these messages and the resulting body dissatisfaction. The added path between family meal environment and attention bias toward

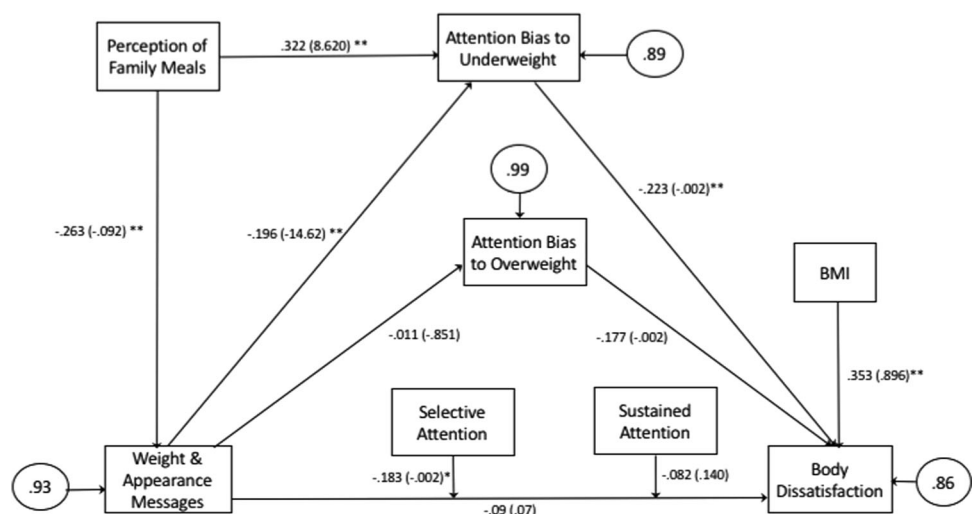
underweight bodies was also significant [$\beta = .321$, 95 % CI (-.415, -.041), $p < .015$].

Participants reporting more appearance related messages and expectations, less positive family meal environments, and higher levels of body dissatisfaction responded quicker on trials with the underweight stimuli. Surprisingly, attention bias to overweight bodies was not related to either the perception of the messages received [$\beta = -.011$, 95 % CI (-.178, .202), $p < .904$] or body dissatisfaction scores [$\beta = -.177$, 95 % CI (-.381, .03), $p < .098$]. The indirect effects of attention bias on the relationship between sociocultural measures and body dissatisfaction were then examined within the joint-significance paradigm. Significant indirect effects were found between perception of messages from friends and family and body dissatisfaction [$\mu = .04$, $\sigma = .025$, 95 % CI = (.004, .102)] and between perception of family meals to body dissatisfaction [$\mu = -.07$, $\sigma = .033$, 95 % CI (-.145, -.015)] by way of attention bias to underweight bodies. Though small, the effect sizes of the direct and indirect relationships were significant and meaningful (Abelson 1985), with the model explaining 7 % of the variance in perception of weight and appearance related messages from friends and family ($p < .01$), 11 % of the variance in attention bias to underweight bodies ($p < .007$), and 13.6 % of the overall variance in body dissatisfaction ($p < .04$).

Role of Basic Sustained and Selective Attention

The moderated pathways within the model were included as an attempt to better identify which participants were most vulnerable to the cognitive effects of appearance related comments and expectations. Selective attention scores significantly moderated the pathway between perception of appearance related comments from friends and family and

Fig. 4 Final tested model, including paths from perception of family meal environment to attention-bias measures. *Note* Greater selective attention, greater attention bias to threat, and fewer weight and appearance related messages will be indicated by smaller values. Non-significant covariates are not pictured for clarity. Unstandardized coefficients appear in parentheses. * $p < .05$; ** $p < .01$



body dissatisfaction, [$\beta = -.183$, 95 % CI $(-.322, -.037)$, $p < .014$]. Appearance related comments were associated with greater body dissatisfaction for individuals with stronger selective attention skills (those with faster reaction times). In contrast, we failed to find significant moderation of this pathway by sustained attention skills [$\beta = -.082$, 95 % CI $(-.262, .085)$, $p < .328$].

Discussion

The current study aimed to extend existing sociocultural models of body dissatisfaction in early adolescence by identifying the cognitive components linking appearance and weight-related messages and expectations to body dissatisfaction outcomes. The findings from the current study highlight the importance of examining body dissatisfaction within a broadened cognitive-sociocultural model that simultaneously considers the cognitive, environmental, and sociocultural influences on body dissatisfaction in early adolescence. As attention biases have been identified as a key cognitive component to the maintenance of adult body dissatisfaction (Rodgers and Dubois 2016), we examined attention skills and biases in tandem with sociocultural factors, demographic, and select biological variables in predicting body dissatisfaction levels. While prior studies focus on attention bias group differences between body satisfied and body dissatisfied women (Smith and Rieger 2006), this study is the first to date to quantify body dissatisfaction attention biases in early adolescence, and the first to link attention biases to sociocultural factors.

Building upon prior findings with body dissatisfied adults and women with clinical eating disorders, more pronounced attention biases to underweight stimuli significantly predicted body dissatisfaction in our nonclinical, early adolescent sample. This attention bias was also significantly related to the adolescents' perceptions of weight and appearance related messages and expectations held by friends and family. By providing a direct measure of attention bias, this finding extends the existing body of literature concerning the sociocultural determinants related to appearance schemas and body dissatisfaction in early adolescence (Sinton and Birch 2006). Prior research and theoretical frameworks have suggested that high levels of appearance schematicity, predictive of high levels of body dissatisfaction, functions by driving attention toward appearance-relevant feedback in the environment (Altabe and Thompson 1996). Our model empirically supports this assertion, and aligns closely with the conceptual model put forth by Williamson and colleagues (2004) in outlining the cognitive-behavioral theories of disordered eating. Williamson's model, though intended for a different population and outcome, identifies a feedback loop among body and

food related stimuli in the natural environment, appearance related self-schemas, cognitive biases, weight-change strategies and reinforcement of fear of fatness, over concern with body size, and internalization of the thin ideal. It is possible that the emotionally salient stimuli used in the current study's body dissatisfaction dot-probe task serves as an implicit measure of both the thin-ideal internalization (attention to the underweight bodies) and fear of fatness (attention to the overweight bodies). Considering these two attention biases as distinct cognitive constructs with unique valences helps to clarify the differential impact of each bias within the final model.

Although mean level differences pointed to a more pronounced attention bias to overweight compared to underweight stimuli, the attention bias to underweight stimuli demonstrated stronger associations with other elements within the model. As outlined by Rodgers and Dubois (2016), it is possible that the attention bias to overweight stimuli occurs when the stimuli are considered self-reflective and interpreted as egosyntonic with the self, whereas the underweight stimuli are processed as mirroring the larger environment and invoke social comparison processes. Alternatively, this finding may also reflect the ubiquity of weight biases in society (Ata and Thompson 2010), even among youth and adolescents (Latner et al. 2007), such that a ceiling effect emerged in the predictive power of this measure. It is possible that attention biases to underweight stimuli, and the associated thin idealization and body dissatisfaction, are more highly correlated with appearance related messages compared to weight bias and excessive allocation of attention to overweight stimuli in early adolescence.

While we also did not find a direct relationship between comments received from friends and family to body dissatisfaction, our hypotheses extending the additive impact of sociocultural feedback on body-related attention biases to the basic cognitive skills of sustained and selective attention were partially supported. More frequent weight and appearance related messages interacted with the basic attention process of selective attention, but not sustained attention, to predict body dissatisfaction. This moderated path indicates that the harmful effect of comments from and unrealistic expectations of friends and family on body dissatisfaction is diminished when the adolescent receiving these comments is quick to shift attention away from these comments. The absence of significant moderation by the basic sustained attention task suggests that, although both selective and sustained attention have been implicated in attention biases, selective attention may be the driving force behind the allocation of attention toward the cues in the environment that reinforce body dissatisfaction and the perceived necessity to engage in body-change strategies. Based on this finding, it follows that in more ecologically

valid settings, such as when socializing with friends and family, weight and appearance related comments are the least detrimental when attention is quickly drawn away from the content of the messages. These findings support the idea of training body dissatisfied adolescents to recognize what they are attending to, and how to re-direct that focus. Attention-bias modification treatments have been successfully administered to children and adolescents with anxiety (Bechor et al. 2014), and have been suggested for individuals with eating disorders (Renwick et al. 2013). Although the most effective implementation method remains unclear, the current research suggests such a framework may be appropriate for body dissatisfied adolescents. However, these existing interventions target cognitive processes at the expense of socio-cultural and environmental contributors.

The final model identified family meal environment perceptions as an additional sociocultural factor associated with attention biases. This measure was initially included within the model to capture additional variance associated with the sociocultural influences on positive and maladaptive developmental outcomes (see Fulkerson et al. 2006). While the family meal environment scale we included did not directly inquire about the content of meal discussions, it is possible the more negatively experienced meal settings also include discussion that is hyper-focused on food choices and weight or appearance observations and pressures. Such discussion would drive attention toward weight loss strategies and goals (Berge et al. 2013), and thus explain the significant relationship between attention bias to underweight bodies and perceptions of family meal environment. Future research would benefit from a closer analysis of this relationship by gathering more detailed information about the specific content of the family meal environment.

The current study comes with several other limitations and brings multiple opportunities for future research integrating cognitive and sociocultural models of body dissatisfaction. We successfully identified the interplay between cognitive and factors on body dissatisfaction in females, but only at one critical slice of time within the developmental trajectory of early adolescence. These findings highlight the coaction between the individual's cognitions and the feedback provided by her environment on body dissatisfaction, and will be strengthened by future longitudinal research identifying the developmental antecedents, temporal patterns, and long-term additive effects of this interaction. Our final model included a limited number of sociocultural constructs known to predict body dissatisfaction, leaving room for future research to examine how attention skills and biases operate with additional sociocultural, biological, and psychosocial components, including self-esteem and media influences, to produce body dissatisfaction.

We faced several other methodological challenges in study design and implementation. As a result of conducting research in a community-based setting to have more heterogeneity in our sample, we relied on parent report of weight and height, which may not be recalled and reported accurately. For this reason, we examined BMI categorically. Use of a continuous BMI scale, calculated from measurements obtained in a standardized laboratory setting, may give BMI more predictive strength within the model structure. Of note, while BMI is still the preferred method of defining a healthy weight widely used in research and clinical practice, it can lead to misclassification of health outcomes (Tomiyama et al. 2016). Our sample size was large enough to sufficiently evaluate the hypothesized model, but we were limited in our ability to examine how the model fits across different groups, such as weight status, age, race, and ethnicity. Similar to Heron and colleagues (2013), we did not find mean level differences in sociocultural constructs by race or ethnicity. Although no group-level differences in predictor or outcome variables emerged across pubertal status, race and ethnicity, and those that did occur across weight status and age were controlled for within the model structure, we might find that the relationships within the model pattern differently when explored with across these categories in a larger sample using multi-group path analysis. Lastly, although there is theoretical and methodological rationale for examining these interrelations in an exclusively female sample, these results are not generalizable to male emerging adolescents. Modification of the research instruments to assess attention, body dissatisfaction, and associated sociocultural factors for male adolescents may shed light on the mechanism behind the gender differences previously established in the literature.

Conclusion

The current study emphasizes the importance of considering the interplay among multiple aspects of the individual and her environment in identifying the factors associated with body dissatisfaction in early adolescence. The cognitive-sociocultural model proposed and tested here provides a cognitive explanation for the well-established link between appearance related feedback and body dissatisfaction (Keery et al. 2004). Within the last decade, several frameworks focusing on the socio-environmental factors contributing to body dissatisfaction, including peer relationships, self-esteem, and media literacy, have been implemented within pre-adolescent and adolescent samples with mixed success (Bird et al. 2013). The current findings support the addition of a cognitive, selective attention-based component, supplementing the psycho-education these

interventions deliver, at a time when attention skills are still flexible and plastic. As body dissatisfaction during late childhood and early adolescence is associated with a host of poor developmental outcomes (Paxton et al. 2006), identification of new cognitive contributors to body dissatisfaction and the successful incorporation of these factors into future intervention and prevention work is critical to the promotion of positive adolescent development.

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Authors' Contributions JFS conceived of the study idea, conducted all data collection sessions, analyzed the data, drafted and revised the manuscript. LDF provided feedback on the conceptual and theoretical aspects of the study and manuscript revisions. Both authors approve of the final version of the manuscript.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Compliance This work was approved by the Social and Behavioral Institutional Review Board at Florida International University prior to any collection of data.

Informed Consent Prior to research participation, written informed consent was obtained from the parent or legal guardian and written informed assent was obtained from all study participants.

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