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Concurrent and Convergent Validity of the Eating in the Absence of Hunger Questionnaire and Behavioral Paradigm in Overweight Children

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Abstract

Objective—This study aimed to assess the concurrent and convergent validity of the Eating in the Absence of Hunger (EAH) questionnaire parent report of child (EAH-PC) and child self-report (EAH-C) with the EAH behavioral paradigm (EAH%) and usual dietary intake.

Method—Data were obtained at baseline assessment for 117 treatment-seeking overweight and obese (BMI > 85th percentile) 8- to 12-year old children (53% female, 54% white) and their parents. Children participated in the EAH free access paradigm after a standardized *ad libitum* meal. Parents and children completed EAH questionnaires, and the children completed three 24 h recalls. EAH External Eating subscale and total scores were assessed.

Results—EAH% was inversely associated with the EAH-PC total score ($p < .04$), however, it was not associated with the EAH-PC External Eating scale, EAH-C total score or EAH-C External Eating scale. Daily caloric intake was positively related to both the EAH-C total score ($p < .02$) and External Eating subscale ($p < .007$). Daily caloric intake was inversely related to EAH-PC total score ($p < .05$), but was not related to EAH-PC External Eating subscale or EAH%.

Discussion—Concurrent validity was not supported for EAH questionnaires, but convergent validity was supported for EAH-C and child daily caloric intake. Further research is warranted to assess whether EAH questionnaires and paradigm are measuring different aspects of EAH in treatment-seeking children.

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Keywords

eating in the absence of hunger; disordered eating; obesity; children; assessment

Introduction

There has been a dramatic rise in the prevalence of pediatric obesity,[1] which is associated with a decline in overall life expectancy in the United States.[2] Currently, approximately one third of children are overweight or obese,[3] which is concerning given that pediatric overweight status is a robust predictor of adult obesity.[4–6] Eating in the absence of hunger (EAH) appears to be an important marker of childhood obesity.[7] Defined behaviorally, EAH refers to the consumption of calories beyond the point of subjectively reported physical satiety and has been found to persist over time.[8,9] EAH in childhood is associated with childhood overweight and obesity as well as increased adiposity in childhood, although some results have varied by sex.[10,11] EAH is also robustly associated with adolescent overweight.[12] EAH in children has been found to be significantly related to parental weight,[8] parental restriction of food,[13–15] and maternal pre-pregnancy weight.[16] EAH is also associated with maternal disinhibition of eating, although this relationship was only found in girls, not boys.[17] Furthermore, EAH is associated with eating pathology including loss of control eating in youth.[18] In summary, the study of EAH in children may be important in terms of elucidating the causal mechanisms of obesity and ultimately for the development of interventions to reduce obesity in pediatric populations.

Currently, there are only two types of measures that directly aim to capture EAH in children. The original measure of EAH uses a laboratory paradigm that presents children with an *ad libitum* meal, followed by a taste test of snack foods, and then a ten minute period in which youth are given unsupervised free access to the snack foods.[14] However, the EAH paradigm is a costly and time-consuming behavioral task that is usually conducted in a university based laboratory. As with any laboratory assessment, advantages of measurement sensitivity, and internal validity are accompanied by a loss of ecological validity. Furthermore, as self-awareness increases throughout development, it is possible children become more self-conscious about eating in the laboratory, which could impact the validity of this measure. The EAH paradigm may be subject to differential rates of social response bias in children, depending on the social situation.[11] Due to the aforementioned challenges of the EAH paradigm, researchers have begun to explore alternative ways of assessing EAH in children.

In order to more efficiently and economically assess EAH, the Eating in the Absence of Hunger Questionnaire for Children and Adolescents (EAH-C) and the Parent Report of Child Eating in the Absence of Hunger (EAH-PC) were developed.[7,19] For each questionnaire, three subscales are computed from items on the EAH-C and EAH-PC: EAH in response to External Eating cues, Negative Affect, and Fatigue/Boredom. All three scales of both measures have demonstrated good internal consistency, concurrent validity, and temporal stability.[7,12] In a sample of non-treatment seeking adolescents, the EAH-PC, but not the EAH-C, demonstrated strong construct validity with the EAH paradigm.[19] However, the extent to which the EAH questionnaires show concurrent validity, by correlating with the behavioral paradigm, has not been investigated in a middle childhood sample. Furthermore, the EAH-C and EAH-PC have not been evaluated in terms of their convergent validity. Convergent validity of the EAH-C and EAH-PC would demonstrate that these measures had a significant correlation between their own scores and the scores of another measure that assesses a different but theoretically similar construct.

The main purpose of this study is to examine the concurrent validity between the EAH questionnaires and the EAH paradigm. We hypothesized that higher scores on the EAH-C and EAH-PC External Eating Subscale and total scores would be associated with higher EAH in the behavioral paradigm. Our second objective was to evaluate the convergent validity between EAH questionnaires and the EAH paradigm, by addressing whether these measures are associated with daily caloric intake. We predicted that higher scores on the EAH questionnaires and EAH paradigm would be related to higher levels of daily caloric intake.

Method

Participants

Participants were 117 overweight or obese children (BMI >85th percentile)[20] and their parents who completed a baseline evaluation for a treatment study for childhood overeating. Study recruitment took place in the greater Minneapolis/St. Paul area of Minnesota. Participant pairs were recruited using physician referrals, direct mailings, and advertisements.[21] All participating parents signed an informed consent; all participating children signed an informed assent. The study was approved by the University of Minnesota Institutional Review Board. All data analyzed for this study were obtained at the baseline assessment, prior to the initiation of any treatment.

Measures

EAH-C—The Eating in the Absence of Hunger Questionnaire for Children and Adolescents (EAH-C) is a 14-item self-report survey.[7] Items for the measure focus on emotional and external cues that precipitate eating in the absence of hunger. The EAH-C consists of three subscales: External Eating, Negative Affect, and Fatigue/ Boredom (Cronbach's alphas: 0.80–0.88).[7] Additionally, researchers calculated an EAH-C total score by averaging the mean of all subscale means. In the first half of the questionnaire, children read a prompt stating, "Imagine that you are eating a meal or snack at home, school, or at a restaurant. Imagine that you eat enough of your meal so that you are no longer hungry." Following this prompt, children respond to questions about whether they would *keep eating* for various reasons, including "because the food looks, tastes, or smells so good" or "because others are still eating" or "because you are feeling sad or depressed." In the second half of the questionnaire, children read a prompt stating, "Now imagine that you finished eating a meal or snack some time ago and you are not yet hungry." They are then asked questions about whether they would *start eating* for the same reasons quoted above. Children choose from the following responses on a five-point Likert type scale: Never, Rarely, Sometimes, Often, or Always. Children also have the option to respond "I prefer not to answer." Responses of

"I prefer not to answer" were considered missing values. Mean substitution was used to address the missing values (<10%). Children completed the EAH-C on the same day that they participated in the EAH paradigm. Due to the study limitation that there was no mood induction or measure of affect or boredom, the researchers used the External Eating Subscale for analysis, and not the Fatigue/Boredom Subscale or the Negative Affect Subscale. As a follow-up analysis, authors also examined the EAH-C total score to evaluate correlations with the EAH paradigm.

EAH-PC—The Eating in the Absence of Hunger Questionnaire for Children and Adolescents Parent Report of Child (EAH-PC) includes the same three subscales as the EAH-C (Negative Affect, External Eating, and Fatigue/ Boredom) but is completed by parents regarding their child's eating.[22] The EAH-PC total score was created by averaging the means of each subscale, similar to how the EAH-C total score was calculated. Parents read a prompt stating, "Imagine that your child is eating a meal or snack at home, school, or at a restaurant. Imagine that your child eats enough of his/her meal so that he/she is no longer hungry." Following this prompt, parents respond to questions about how often their child would *keep eating* for various reasons, such as "because the food looks, tastes, or smells so good" or "is feeling tired." Parents are also asked how often their child *starts eating* (after they have eaten a meal or snack some time ago and are not yet hungry) in situations such as when the child "is with other people who are eating," or because he or she "is feeling sad or depressed." Parents choose from the following responses on a five-point Likert type scale: Never, Rarely, Sometimes, Often, or Always. For this study, investigators also added an "I don't know" response option for parents and an "I prefer not to answer" option. Approximately 30% of the responses were "I don't know" or "I prefer not to answer." These responses were treated as missing values. Mean substitution was used to address the missing values. Similar to the EAH-C, we analyzed the relationship of External Eating subscale to other measures of EAH, and followed up with statistical tests looking at relationships for the EAH-PC total score.

EAH Laboratory Paradigm—The EAH paradigm is an adaptation of the free-access procedure developed originally by Birch and Fisher.[13] Each child and parent dyad eat a standard *ad libitum* pizza dinner including cheese pizza, carrots, applesauce, and beverages including milk, 100% fruit juice, and water. Satiety is measured using a self-report cartoon representation of three levels of fullness[16] in addition to two questions that ask each child about his or her level of hunger and fullness using a 1–5 scale. The self-report scale ranges from 1: "not at all hungry/full" to 5: "extremely hungry/full."[21] Ten minutes after completing dinner, the child is brought to a private room and presented with pre-weighed samples of 11 sweet and savory snack foods (popcorn, Cheez-it® crackers, potato chips, pretzels, Cheetos®, Fig Newtons®, Hershey® bars, Skittles®, M&M's®, chocolate chip cookies, and Jelly Belly® jelly beans) and is asked to taste, then rate their liking of each food by pointing to cartoon faces which represented "yummy," "just ok," and "yucky."[16] Following the taste test, the child is left alone for 10 min in the same room with toys, games, magazines, and the pre-weighed snack foods remaining from the taste test; the child is told that the research assistant is going to score questionnaires, and that the child is welcome to consume the leftover food and to play with the toys and games. The research assistant returns after 10 min to end the free access session. The remaining food is weighed to calculate calories consumed during the free access session. Percent of daily calorie needs consumed during the free access session (EAH%) is calculated by dividing the number of calories consumed during the free access session by the child's estimated daily caloric needs based on formulas taking into account weight, age, height, sex, and physical activity level. As a conservative measure, a physical activity level of "low active" is used for all children to estimate daily caloric needs.[23] In addition, calories consumed during the pizza dinner are recorded and adjusted for in analyses, to control for how many calories the child ate at dinner.

Daily Caloric Intake—Daily caloric intake was assessed using three nonconsecutive 24-h recalls conducted by a trained dietary interviewer. The use of 24-h recalls in children has been a standard evaluation in food consumption literature, although it has been shown that children, like adults, have biases in reports of dietary consumption.[24–27] The first interview was conducted in person during the study visit when the EAH paradigm and other EAH measures were administered. Plastic food models and a food amounts booklet were available for the child to use to estimate amounts consumed. Children who qualified for the study completed two additional 24-h recalls over the phone within 2 weeks of the initial interview. These phone interviews were conducted on non-consecutive days when the child had access to the food amounts booklet. The recalls were collected and analyzed using Nutrition Data System for Research (NDS-R) software version 2007.[21] The 24-h recall is performed using an open format during which the dietary interviewer solicits detailed information using the NDS-R multiple-pass interview methodology. During each 24-h recall, caloric intake is first reported by the child and then corroborated with parent input. Caloric intake is averaged across the 3 separate days. For this study, only those children who completed three 24-h recalls were included in analysis. This subsample consisted of 82 children.

Anthropometry—Child and parent height and weight were measured in duplicate by trained research assistants using standardized measures and protocols. Weight was taken twice with outerwear and shoes removed on a calibrated slide scale. Height was measured using a standard stadiometer with shoes and hair accessories removed. The duplicate measures were then averaged for analysis. Child and parent BMI and BMI-Z calculations were made based on CDC growth charts.[20]

Statistical Analysis

Data were analyzed using SPSS Version 15. Pearson correlations were used to examine relationships between the EAH-C and EAH-PC External Eating scales, and the EAH paradigm. As a follow-up, Pearson correlations were also used to examine relationships between the EAH-C and EAH-PC total scores and the EAH paradigm.

Multiple linear regressions were used to evaluate concurrent validity of the EAH questionnaires with the EAH paradigm. Demographic variables of age, sex, and race, BMI-Z, and calories consumed at dinner were included as covariates. The authors examined both unadjusted and adjusted models using multiple linear regression analyses to test concurrent validity. Researchers first evaluated relationships with the EAH-C and EAH-PC External

Eating subscales, and then followed up with an analysis of EAH-PC and EAH-C total scores.

To examine convergent validity between EAH questionnaires, EAH paradigm, and daily caloric intake, multiple linear regressions controlling for covariates (age, sex, race, BMI-Z, and calories consumed at dinner) were used to examine whether EAH-C External Eating scale, EAH-PC External Eating scale, and EAH paradigm were associated with daily caloric intake, using the 82 participants who completed three 24-h recalls. As a follow-up, EAH-C and EAH-PC total scores were also analyzed. The total score was considered particularly interesting in regards to the analysis of EAH-C and EAH-PC as related to daily caloric intake, because conceptually, daily caloric intake would reflect all types of EAH, including that which is induced by fatigue/boredom and negative affect.

Results

Participant demographics are presented in Table 1. Children had a mean age of 10.42 (SD = 1.35) years, were 53% female, and were overweight [mean BMI = 27.22 (SD = 4.56)]. EAH-C and EAH-PC both showed good internal consistency (Cronbach's alphas: EAH-C = 0.89; EAH-PC = 0.88). Results consisted of a wide range of EAH as represented by percent of the child's daily caloric needs consumed (0–96 EAH%; mean = 15%, SD = 12%). Distribution of macronutrients, total calories, and estimated % daily caloric requirements served and consumed in the dinner and EAH paradigm and reported in recalls of daily caloric intake are shown in Table 2. It is of note that the average number of calories consumed during the free access to snack foods was over 50% of the average calories consumed during the dinner provided for the EAH paradigm. Analysis showed that sex was significantly correlated with EAH% ($\beta = 0.225$, $p < .03$) such that girls ate more calories as a percent of daily calorie needs during the EAH paradigm (mean EAH% = 17.3, SD = 1.4%) than boys (mean EAH% = 13.0%, SD = 7.8%). Dinner caloric consumption was also found to be significantly associated with EAH% such that eating more calories at dinner was related to a higher caloric intake during the EAH paradigm ($\beta = 0.260$, $p < .01$). EAH-C and EAH-PC total scores were significantly correlated with each other ($r = 0.344$, $p < .001$). EAH-C External Eating subscale and EAH-PC External Eating subscale were not significantly correlated with each other (Table 3).

Concurrent Validity of the EAH Questionnaires and the EAH Paradigm

Multiple linear regressions controlling for covariates (age, sex, race, BMI-Z, and calories consumed at dinner) were used to examine associations between EAH-C External Eating subscale, EAH-PC External Eating subscale, or EAH-C total score, EAH-PC total score, and EAH% (Table 4). The EAH-C External Eating subscale, EAH-PC External Eating subscale, and EAH% were entered in one model controlling for child sex, age, BMI-Z, calories consumed at dinner, and race; 12% of the variance was explained and the overall model was approaching significance, $F(7, 105) = 2.053$, $p = .06$. No significant relationship was found between EAH-C External Eating subscale or EAH-PC External Eating subscale and caloric intake during the EAH paradigm (Table 4).

The EAH-C and EAH-PC total scores (independent variables), and EAH paradigm (dependent variable) were entered in another model controlling for child sex, age, BMI-Z, calories consumed at dinner, and race; 15.3% of the variance was explained and the overall model was significant, $F(7, 105) = 2.715$, $p < .02$. The EAH-PC total score was significantly related to EAH% such that higher parent reported child EAH was associated with lower EAH% as measured in the EAH paradigm ($\beta = -0.214$, $p < .04$). EAH-C total score was unrelated to EAH% during the EAH paradigm (Table 4).

Convergent Validity Between the EAH Questionnaires and Daily Caloric Intake

Results from the analysis between EAH-C External Eating subscale, EAH-PC External Eating subscale (independent variables), and daily caloric intake (dependent variable) showed that 30.9% of the variance in caloric intake was explained; the overall model was significant, $F(8,70) = 3.921$, $p < .002$. Specifically, EAH-C External Eating subscale was significantly associated with reported daily caloric intake ($\beta = 0.296$, $p < .007$), with higher child self-report on the EAH External Eating subscale predicting higher daily caloric intake. EAH-PC External Eating subscale and EAH% were not significantly associated with daily caloric intake (Table 5).

As a follow-up, results showed that when analyzing EAH-C and EAH-PC total scores (independent variables) in a model with daily caloric intake (dependent variable), 31.8% of the variance in caloric intake was explained, and the overall model was significant, $F(8,70) = 4.081$, $p < .001$ (Table 5). Specifically, EAH-C total score was significantly correlated with reported daily caloric intake ($\beta = 0.280$, $p < .02$), with higher child self-report of EAH predicting higher daily caloric intake. EAH-PC total score was inversely related with child daily caloric intake ($\beta = -0.240$, $p < .05$). The EAH paradigm was not significantly associated with daily caloric intake.

Discussion

This study was designed to assess the concurrent validity of child self-report and parent report of child EAH questionnaires using the EAH paradigm as the criterion. In addition, authors evaluated whether the EAH questionnaires were related to daily dietary intake. Researchers did not find a significant relationship between the EAH-C External Eating subscale, EAH-PC External Eating subscale, or EAH-C total score, and calories consumed during the EAH paradigm. Paradoxically, we found that higher ratings on the EAH-PC total score were associated with lower calories consumed during the free access portion of the EAH paradigm. Parent and child report of EAH total score (EAH-C and EAH-PC) were correlated. However, the External Eating subscale was not correlated between parent and child report. Both the EAH-C External Eating subscale and total score were positively correlated with dietary intake. However, EAH-PC External Eating subscale was inversely associated with usual daily caloric intake, while the EAH paradigm and EAH-PC total score maintained no relationship with daily caloric intake. Our findings suggested that in this study, neither parents nor children were very accurate reporters of child EAH as compared to a behavioral measure in the laboratory (EAH paradigm).

There are several reasons why this study did not provide evidence for the concurrent validity of the EAH-C and EAH-PC questionnaires. It is possible that while parents often observe and are consciously aware of their children's structured eating habits, they may be unaware of their children's eating when they are not physically hungry. This may explain the inverse relationship between parent report of child EAH and child calorie consumption during the EAH paradigm. Given that children completed these measures prior to involvement in a treatment for overeating, it is possible that the knowledge of initiating a program combined with the artificial laboratory environment impacted their eating behavior during the EAH paradigm. Therefore, a non-treatment-seeking middle childhood sample may be another informative sample to study. Another possible reason for the lack of correlations between measures is the age of the children participating in this study. These children may be too young to assess their own EAH behaviors. In a recent study of older, community adolescents, Shomaker et al.[19] found the EAH-PC External Eating subscale demonstrated construct validity with the EAH laboratory paradigm. However, there were several dissimilarities between the Shomaker et al. study and the present study, including the age of the youth, the metric of EAH and the different foods provided. Adolescents in the Shomaker et al. study also ate alone, while children in the present study ate dinner with their parents in the room. In the Shomaker study instructions for the EAH paradigm were played from a pre-recorded tape, and the taste test was completed without anyone else in the room, while in the current study, instructions for the EAH paradigm and taste test were completed by the research assistant. Additionally, the Shomaker study analyzed the number of calories consumed, while our study adjusted for the daily caloric needs of the child, based on age and gender.

In addition to our primary objective, we evaluated whether there was convergent validity between the EAH self-report measures, the EAH paradigm and dietary intake. Results suggested that EAH-C External Eating subscale, and EAH-C total score, were positively associated with daily caloric intake. However EAH-PC total score was inversely related to daily caloric intake, and the EAH-PC External Eating subscale did not demonstrate a statistically significant relationship with daily caloric intake. The positive association between child-report of EAH and daily caloric intake could suggest that the EAH-C may be measuring an overall dysregulation with food. This idea of overall dysregulation was also supported by the positive correlation between calories consumed at dinner and in the EAH free access session. Further research is needed to explore this hypotheses.

It is very possible that the questionnaires and the behavioral paradigm measure different aspects of EAH in children. The EAH-C and EAH-PC may have measured self-awareness or cognitive awareness of EAH while the EAH paradigm may have measured behavioral disinhibition with or without cognitive awareness. This distinction is especially important in younger children who are in the process of developing cognitive awareness and abstract thinking. Research has been conducted to assess the presence and influence of mindless eating on the obesity epidemic as well as overeating in general.[28] This research has led to an acknowledgement that self-report of caloric consumption is often under-reported across the developmental lifespan of youth.[29] It is possible that the findings in this manuscript may be further reflections of inaccurate self-report of caloric intake, in this case, specifically in reference to EAH.

Previous research suggests that children, like adults, are not necessarily accurate reporters of their own dietary behavior.[24] It is possible that this lack of accuracy may also be reflected in their recollections of EAH, which may have contributed to the findings in this study. Inaccurate recall of food intake is robustly reported across the lifespan.[30–32] In children, for whom capacities for episodic memory continue to mature,[33] the issue of inaccurate recall of food consumption may have been particularly salient in this study, contributing to the lack of association between measures. This study used open 24-h recalls with children and corroborated evidence with parents, however the study did not include a check for food intrusions. Because children have been shown to misreport on dietary recalls in several different circumstances, the use of 24-h recalls should be considered a possible limitation to this study.[34]

In contrast, the EAH-PC elicits parent perceptions of child EAH, which is naturally reliant on parental observation of the child. In addition, EAH inherently includes an assessment of hunger, which can only be recognized by the child. It is of note that the child may experience EAH at times when the parent is not present. Although the total scores from the EAH-C and EAH-PC are correlated between parent and child report, this same finding was not present when examining External Eating subscale scores. Thus, EAH-C External Eating subscale, the EAH-PC External Eating subscale and the EAH laboratory paradigm may reflect different perspectives of the EAH construct, and further research is needed to differentiate which aspects of the construct are represented by these different EAH measures.

Although not a primary aim of the current study, we found that girls had higher rates of EAH than boys and that EAH was higher in children who consumed more calories during the standardized *ad libitum* dinner. The sex difference found in this study is in contrast to other studies. In an EAH study in which the EAH paradigm was administered to children eating together at school, Hill et al.[11] found that boys engaged in higher levels of overeating in the EAH paradigm than girls. The authors suggested that girls may have felt more pressure to behave in socially desirable ways by constraining food intake, especially in a group setting without privacy. In contrast, girls in this study were alone during the free access session, suggesting that when social pressures are not present, girls may be more likely to eat beyond satiety. Sex differences were also found in a study comparing EAH in boys and girls such that boys who were genetically at higher risk for obesity exhibited significantly more EAH than boys at lower risk, while EAH in girls was not related to genetic risk and may be more associated with environmental factors.[16] Thus, the current study may provide an alternative view that the pathways through which EAH is manifested are different for boys than for girls and that the design of this study potentially facilitated the expression of EAH in girls more so than in boys.

The correlation between high EAH and greater calorie intake in the *ad libitum* dinner was consistent with other published studies.[12] Assuming that children cease eating based on satiety, the children who consumed more calories during dinner (assuming greater physical satiety) would presumably consume fewer snack foods during free access to snack foods; however, the opposite was found. This finding implies that overeating behaviors during free access may be carried over from dinner. Furthermore, dys-regulation or lack of inhibition in food consumption may underlie EAH, regardless of the level of physical satiety and may apply across eating situations. Our findings are consistent with other studies that suggest that overweight children may be more cue sensitive[35,36] and may have poorer inhibitory control than their normal weight counterparts.[37]

Strengths of this study include the use of multiple measures of EAH including the behavioral paradigm, self-report of EAH, parent report of child EAH, as well as the use of three 24-h recalls of dietary intake. The sample is also diverse in terms of race, ethnicity and sex. Limitations include an entirely overweight treatment seeking sample and a one time assessment of EAH in the behavioral paradigm. Additionally, findings cannot be generalized to non-obese or weight heterogeneous populations. Similarly, the sample consists of entirely treatment-seeking families with children in the 8- to 12-year-old range and may not be representative of a non-treatment-seeking population or of younger or older children. The use of 24-h recalls should also be considered a limitation in addition to a strength of this study due to children's difficulty producing accurate dietary recall, as discussed previously.[24–27] A further limitation of this study is that the researchers did not assess for negative affect or fatigue/boredom during the EAH paradigm. Therefore there is no way for the researchers to know if any of the participating children were experiencing either of these emotions. It is possible that these emotions were present and may have affected the calories consumed during the EAH paradigm, but the researchers are unable to analyze this question. This limitation is related to the reasoning behind the researchers' decision to analyze the External Eating subscale as the primary measure of self-reported EAH. Finally, this study relies on a one-time assessment of EAH, but it is possible that EAH may vary over time or during different measurements.

Despite these limitations, this is the first study to evaluate the concurrent and convergent validity of the EAH questionnaires and the EAH paradigm in 8- to 12-year-old children. We did not find concurrence between the EAH questionnaires and the paradigm in this sample. However, we did find moderate support for convergent validity between the EAH-C and daily caloric intake. Given the general agreement between child and parent reports of EAH shown by the total score, further research is warranted to determine which aspects of EAH are being assessed by the questionnaires and the paradigm, in a broader sample that includes healthy weight and overweight youth. In addition, further examination of the association between mood and EAH by assessing for affect during the EAH paradigm, or by inducing mood prior to the EAH paradigm would add additional information in further explorations of the reliability and validity of the EAH-C and EAH-PC questionnaires as they are related to the EAH paradigm. Further research is also needed to identify how these measures, EAH-C, EAH-PC, or EAH% predict weight outcomes over time, and how to identify treatment and prevention strategies for EAH in children.

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TABLE 1

Demographic characteristics of children and parents

	***n* = 117 pairs**
Child	
Sex (% female)	53
Age (mean, SD)	10.42 (1.35)
Race	
Caucasian (%)	54
African American (%)	14
Multi-Race (%)	20
Other (%)	12
BMI (SD)	27.22 (4.56)
BMI-Z (SD)	2.06 (.39)
EAH% (mean percent of daily caloric needs, SD)	15.22 (11.60)
Parent	
Sex (% female)	91
Marital Status (% currently married)	68
Education (% college graduates)	57
Race	
Caucasian (%)	70
African American (%)	14
Multi-Race (%)	8
Other (%)	8
Mother's BMI (mean, SD)	31.53 (7.09)

SD, Standard Deviation; BMI, Body Mass Index; BMI-Z, Body Mass Index *Z*-Score; EAH, Calories consumed during the Eating in the Absence of Hunger Paradigm.

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TABLE 2

Distribution of macronutrients, total calories, and estimated % daily caloric requirements served and consumed in the dinner and EAH paradigm and reported in recalls of daily caloric intake

	Fat (%)[a]	Carbohydrates (%)[a]	Protein (%)[a]	Total Calories	% Daily Estimated Caloric Requirement
Served in laboratory paradigm					
EAH	33.03	63.63	3.90	10121.86	405.64
Dinner	17.91	64.08	18.15	2172.39	87.06
Total	25.47	63.86	11.03	12294.25	492.70
Consumed in laboratory paradigm					
EAH	37.69	60.30	3.76	366.21	14.68
Dinner	20.75	61.08	18.11	674.39	27.03
Total	29.22	60.69	10.96	1040.60	43.33
Reported in 24-h recall of caloric intake					
	30.91	53.87	15.23	1942.90	81.26

[a]% percentage of total calories from specified macronutrient.

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TABLE 3

Bivariate Correlations Between EAH Paradigm and EAH-C and EAH-PC External Eating Subscales and Total Scores (n = 117)

		Child		Parent	
	EAH%	**EAH-C**	**EAH-C External Eating Subscale**	**EAH-PC**	**EAH-PC External Eating Subscale**
EAH%	–				
EAH-C	−0.04	–			
EAH-C external eating subscale	0.01	0.85^{c}	–		
EAH-PC	−0.12	0.34^{c}	0.17	–	
EAH-PC external eating subscale	−0.08	0.25^{b}	0.18	0.59^{c}	–

^{a}p <.05.

^{b}p <.01.

^{c}p <.001.

EAH, Eating in the Absence of Hunger; EAH%, Percent of daily calorie needs eaten in EAH laboratory paradigm; EAH-C, EAH-Child Questionnaire; EAH-PC, EAH-Parent report of Child Questionnaire.

TABLE 4

Linear regression analyses evaluating the relationship between EAH-C External Eating Subscale, EAH-PC External Eating Subscale, EAH-C Total Score, EAH-PC Total Score, and EAH Percent, controlling for sex, age, BMI-*Z*, dinner caloric intake, and race (*n* = 117)

EAH External Eating				EAH Total Score			
Variables	**B**	**SE**	***B***	**Variables**	**B**	**SE**	***B***
Sex	0.039	0.022	0.168	Sex	0.052	0.022	**0.225**[a]
Age	0.001	0.009	0.003	Age	0.001	0.009	0.013
BMI-*Z*	0.046	0.029	0.155	BMI-*Z*	0.053	0.028	0.179
Dinner caloric intake	0.279	0.111	**0.250**[a]	Dinner caloric intake	0.290	0.109	**0.260**[a]
Race	0.003	0.023	0.014	Race	0.001	0.022	0.003
EAH questionnaires				*EAH questionnaires*			
EAH-C external eating subscale	−0.001	0.014	−0.006	EAH-C total score	0.000	0.018	−0.001
EAH-PC external eating subscale	−0.016	0.016	−0.094	EAH-PC total score	−0.037	0.017	−**0.214**[a]

[a] $p < .05$.

Sex (1 = Male, 2 = Female).

Race (0 = Diverse background, 1 = White).

BMI-Z, Body Mass Index Z-score; EAH, Eating in the Absence of Hunger; EAH-C, EAH-Child Questionnaire; EAH-PC, EAH-Parent report of Child Questionnaire.

TABLE 5

Linear regression analyses evaluating the relationship between the EAH-C External Eating Subscale and EAH-PC External Eating Subscale, the Behavioral Paradigm and Daily Caloric Intake, controlling for sex, age, BMI-*Z*, dinner caloric intake, and race (*n* = 82)

EAH External Eating				EAH Total Score			
Variables	**B**	**SE**	***B***	**Variables**	**B**	**SE**	***B***
Controls				*Controls*			
Sex	0.072	0.056	0.132	Sex	0.099	0.061	0.183
Age	−0.061	0.022	**−0.302**[b]	Age	−0.055	0.022	**−0.273**[a]
BMI-*Z*	−0.284	0.075	−0.**397**[b]	BMI-*Z*	−0.255	0.075	−0.**356**[b]
Dinner caloric intake	0.009	0.274	0.004	Dinner caloric intake	0.102	0.274	0.041
Race	0.084	0.057	0.154	Race	0.076	0.056	0.139
EAH questionnaires				*EAH questionnaires*			
EAH-C external eating subscale	0.094	0.033	**0.296**[b]	EAH-C total score	0.115	0.044	**0.280**[a]
EAH-PC external eating subscale	−0.032	0.041	−0.081	EAH-PC total score	−0.097	0.047	−0.**240**[a]
EAH paradigm				*EAH paradigm*			
EAH percent	0.122	0.367	0.035	EAH percent	−0.094	0.385	−0.027

[a] $p < .05$.

[b] $p < .01$.

Sex (1 = Male, 2 = Female).

Race (0 = Diverse background, 1 = White).

BMI-Z, Body Mass Index Z-score; EAH, Eating in the Absence of Hunger; EAH-C, EAH-Child Questionnaire; EAH-PC, EAH-Parent report of Child Questionnaire.