

Assessing Mindfulness in Children and Adolescents: Development and Validation of the Child and Adolescent Mindfulness Measure (CAMM)

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This article presents 4 studies ($N = 1,413$) describing the development and validation of the Child and Adolescent Mindfulness Measure (CAMM). In Study 1 ($n = 428$), the authors determined procedures for item development and examined comprehensibility of the initial 25 items. In Study 2 ($n = 334$), they reduced the initial item pool from 25 to 10 items through exploratory factor analysis. Study 3 ($n = 332$) evaluated the final 10-item measure in a cross-validation sample, and Study 4 ($n = 319$) determined validity coefficients for the CAMM using bivariate and partial correlations with relevant variables. Results suggest that the CAMM is a developmentally appropriate measure with adequate internal consistency. As expected, CAMM scores were positively correlated with quality of life, academic competence, and social skills and negatively correlated with somatic complaints, internalizing symptoms, and externalizing behavior problems. Correlations were reduced but generally still significant after controlling for the effects of 2 overlapping processes (thought suppression and psychological inflexibility). Overall, results suggest that the CAMM may be a useful measure of mindfulness skills for school-aged children and adolescents.

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Mindfulness-based interventions are becoming increasingly popular, and the literature supporting their efficacy is growing quickly. The approaches with the strongest empirical support include acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 1999), dialectical behavior therapy (DBT; Linehan, 1993), mindfulness-based cognitive therapy (MBCT; Segal, Williams, & Teasdale, 2002), and mindfulness-based stress reduction (MBSR; Kabat-Zinn, 1982, 1990). Randomized trials of these interventions have shown beneficial outcomes across a vast array of clinical problems, including depression, anxiety, substance abuse, chronic pain, disordered eating, psychosis, and borderline personality disorder, among others (for reviews see Baer, 2003; Coelho, Canter, & Ernst, 2007; Grossman, Neimann, Schmidt, & Walach, 2004; Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Hofmann, Sawyer, Witt, & Oh, 2010; Lynch, Trost, Salsman, & Linehan, 2007).

Mindfulness research over the past two decades has focused primarily on adult clinical populations; however, in recent years these approaches have been adapted for use with children and adolescents (see Greco & Hayes, 2008). For example, Semple and colleagues developed an MBCT protocol that shows promising

preliminary support in anxious children (Semple, Reid, & Miller, 2005). DBT has been successfully adapted for adolescents with bipolar disorder (Goldstein, Axelson, Birmaher, & Brent, 2007), self-injurious behavior (Miller, Rathus, & Linehan, 2007), and binge-eating disorder (Salbach-Andrae, Bohnekamp, Pfeiffer, Lehmkuhl, & Miller, 2008). Similarly, ACT has been adapted for childhood anxiety (Greco, Blackledge, Coyne, & Ehrenreich, 2005), eating disorders (Greco, Barnett, Blomquist, & Gevers, 2008; Heffner, Sperry, Eifert, & Detweiler, 2002) and pediatric chronic pain (Wicksell & Greco, 2008; Wicksell, Melin, & Olsson, 2007). Furthermore, mindfulness-based interventions are being applied across broader social contexts to effect change at home, school, and pediatric medical settings (e.g., Greco, Barnett, et al., 2008; Robinson, 2008; Rogers, Murrell, Adams, & Wilson, 2008; Wahler, Rowinski, & Williams, 2008).

As the empirical evidence for these approaches continues to grow, the importance of examining the processes or mechanisms by which mindfulness-based interventions lead to beneficial outcomes is increasingly acknowledged (Bishop et al., 2004; Dimidjian & Linehan, 2003). Psychometrically sound measures of mindfulness skills are essential for determining whether participation in these treatments leads to increases in the ability to respond mindfully to the experiences of daily life and whether such increases mediate the improvements in psychological functioning that often are observed.

Several tools for assessing mindfulness in adults are now available. These include the Freiburg Mindfulness Inventory (Buchheld, Grossman, & Walach, 2001), the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003), the Kentucky Inventory of Mindfulness Skills (KIMS; Baer, Smith, & Allen,

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2004), the Cognitive and Affective Mindfulness Scale (Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2007), the Philadelphia Mindfulness Scale (Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2007), the Southampton Mindfulness Questionnaire (Chadwick et al., 2008) and the Five Facet Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). Each of these uses self-report methods to assess one or more of the skills that are often described as elements of mindfulness, including observation of present-moment experience, behaving with awareness of one's current actions (rather than automatically or absentmindedly), and taking a nonjudgmental and nonreactive stance toward internal experiences such as cognitions, emotions, and bodily sensations.

Studies of the psychometric properties of these instruments have shown good internal consistency and correlations in the expected directions with other variables in most cases. With a few exceptions, scores on these measures correlate positively with adaptive outcomes and processes such as quality of life, self-compassion, openness to experience, and emotional intelligence (e.g., Baer et al., 2004). In contrast, negative associations have been found with less favorable outcomes and maladaptive processes, including thought suppression and psychological inflexibility (Baer et al., 2004, 2006; Bond et al., 2008; Brown & Ryan, 2003; Cardaciotto et al., 2008). Some measures appear sensitive to treatment effects and meditation experience, with higher scores found among meditators than among nonmeditators (Baer et al., 2008) or among adults participating in mindfulness-based interventions (Carmody & Baer, 2008).

Overall, the literature provides promising support for the psychometric properties and clinical utility of mindfulness measures developed for adult populations. To date, however, none of the existing tools has been validated for use with children and adolescents, and the developmental appropriateness of existing measures is questionable. For example, several measures include items with content that is not relevant for younger respondents (e.g., items about driving in a car on "automatic pilot") or with vocabulary that may be too advanced (e.g., criticizing oneself for having irrational or inappropriate emotions).

To begin to address this problem, Greco, Lambert, and Baer (2008) developed the Avoidance and Fusion Questionnaire for Youth (AFQ-Y), a child-report measure of psychological inflexibility, which is closely related to mindfulness and marked by experiential avoidance and cognitive fusion (two core clinical processes in ACT). Published findings suggest that the AFQ-Y is a developmentally sensitive measure with adequate reliability and validity for youth over the age of 9 years (Greco, Lambert, et al., 2008). These results support the utility of self-report methodology in assessing acceptance-based processes and are consistent with earlier research showing that children can reliably report on their internal experiences (Loeber, Green, & Lahey, 1990).

Despite these recent empirical advances, there are currently no published measures available for children and adolescents that assess mindfulness skills such as present-centered awareness and a nonjudgmental stance toward internal experiences. Development of child and adolescent measures is essential, both for understanding the nature and role of mindfulness skills among youths and for identifying mechanisms of change in mindfulness-based interventions. As an initial step, this article presents four studies that describe the development and initial validation of the Child and

Adolescent Mindfulness Measure (CAMM), which is intended for youths over the age of 9 years. Study 1 ($n = 428$) addressed procedures for item development and establishment of item comprehension. Study 2 ($n = 334$) reduced the initial item pool from 25 to 10 items using exploratory factor analysis (EFA), and Study 3 ($n = 332$) evaluated the final 10-item CAMM in a cross-validation sample using multiple criteria from confirmatory factor analysis (CFA). Study 4 ($n = 319$) determined validity coefficients for the CAMM and examined partial correlations controlling for the effects of two processes (thought suppression and psychological inflexibility) that overlap conceptually and clinically with mindfulness.

Study 1: Item Development

An initial pool of 25 items was generated by Laurie Greco and Ruth Baer. As shown in Appendix A (see online supplemental material), the CAMM asks respondents to rate how often each item is true for them using a 5-point scale (0 = *never true*; 4 = *always true*). Items are based on a multidimensional conceptualization of mindfulness originally proposed by the developers of the KIMS (Baer et al., 2004), which assesses four facets of mindfulness in adults. The KIMS is based largely on the conceptualization of mindfulness skills found in DBT (Linehan, 1993), with strong efforts to be consistent with accounts of mindfulness provided by developers of other contemporary interventions (Kabat-Zinn, 1982; Segal et al., 2002) and by teachers of mindfulness in the Buddhist tradition (Goldstein & Kornfield, 1987; Hanh, 1976; Rosenberg, 1998).

The CAMM items were adapted from three of the four facets found on the KIMS. *Observing* involves the degree to which respondents notice or attend to internal phenomena such as thoughts, feelings, and bodily sensations (e.g., "I pay close attention to my thoughts"). *Acting with awareness* refers to present-centered awareness and full engagement in one's current activity (e.g., "I walk from class to class without noticing what I'm doing"—reverse scored). *Accepting without judgment* entails non-judgmental awareness and openness to experiencing a full range of internal events (e.g., "I get upset with myself for having certain thoughts"—reverse scored). Of note, the CAMM does not include items that reflect *describing*, the fourth facet of mindfulness measured by the KIMS, which involves the ability to put internal experiences into words (Baer et al., 2004). *Describing* items were not included on the CAMM due to the probable impact of participants' developmental level on their responses to such items. Cognitive and verbal capabilities vary widely among youths and continue to develop throughout childhood and adolescence. Therefore, items asking about the ability to label or covertly apply words to internal phenomena are likely confounded with the current level of verbal-cognitive abilities and language development.

In Study 1, four independent raters with expertise in child clinical psychology and mindfulness-based interventions evaluated the initial pool of 25 items. Feedback regarding item clarity and developmental appropriateness guided modifications to the initial item set. The resulting 25 items were administered to 428 fifth-through ninth-grade children (58% girls) participating in a larger study on children's health and peer relationships. Participants were recruited from five public schools in middle Tennessee. Data collection took place during school hours in the cafeteria or library,

and participants were compensated for their time with a \$10 gift card for a major retail store. Participants had a mean age of 12.10 years ($SD = 1.28$ years, range = 10–17 years), and the sample was 82% Caucasian and 14% African American. To investigate comprehensibility of items, participants were asked to circle any confusing items or words. Items rated as confusing by over 2% of the total sample were reworded or replaced (total = four items).

Individual interviews were subsequently conducted with 35 randomly selected participants balanced across grade and sex (7 students per grade; 18 girls). Each of these participants met individually with a graduate or undergraduate research assistant, who read each item aloud and asked participants to put items into their own words and to provide examples of each item to demonstrate comprehension. Minor wording changes were made on the basis of interview responses, and items were sent back to reviewers for final approval. Overall, results of this pilot work suggested good comprehension of items.

Overview of Procedures for Studies 2 and 3

Participants in Studies 2 and 3 were recruited from four public schools in middle Tennessee. Many of these students participated in an earlier project describing the development and validation of the AFQ–Y (Greco, Lambert, et al., 2008). Data collection took place at the participants' respective schools during school hours. Students participated separately by class, with classroom participation rates ranging from 69% to 94% ($M = 81%$). For each group of participants, an undergraduate or graduate research assistant administered measures in a classroom, lunchroom, or library and was available to answer questions during and after each session. At study completion, participants in Studies 2 and 3 were given a \$10 gift certificate for their time and effort. Prior to analyses, the full sample was randomly divided to form a learning sample for EFA and item reduction (Study 2; $n = 334$) and a cross-validation sample for confirmatory factor analysis (Study 3; $n = 332$).

Study 2: Item Reduction Using EFA

Study 2 used EFA to examine factor structure of the 25-item pool and identify items for possible deletion.

Participants and Procedures

Participants in Study 2 ($n = 334$) had a mean age of 12.60 years ($SD = 1.68$ years, range = 10–17 years), and 66% were girls. The sample was 83% Caucasian, 11% African American, 3% Hispanic, 1% Native American, 1% Asian American, and 1% of other or unknown ethnicities. Study 2 participants completed the 25-item CAMM and measures assessing behavioral health outcomes (described in Study 4).

Results and Discussion

Responses of the 334 participants to the initial pool of 25 CAMM items were subjected to EFA using principal axis factoring with oblique rotation to allow for intercorrelations among factors. This initial analysis yielded seven factors with eigenvalues greater than 1.0 and cumulatively accounting for 57.26% of the variance. However, only three of the factors had three or more items with loadings over .35, suggesting that the other factors may not be meaningful (Zwick & Velicer, 1986). The scree plot suggested that

one-, two-, or three-factor solutions would be plausible (Floyd & Widaman, 1995). To avoid problems associated with underextraction of factors (Zwick & Velicer, 1986), the three-factor solution was examined first. The first factor included eight items with loadings over .40 and below .21 on the other two factors. These eight items reflected the tendency to notice or attend to bodily sensations, thoughts, feelings, or environmental stimuli. This factor was labeled *Observing*. The second factor included eight items with loadings over .40 and substantially lower loadings on other factors. These items reflected lack of awareness of ongoing activity and judgmental, nonaccepting responses to thoughts and feelings. The third factor included only three items, all reflecting a nonaccepting, avoidant stance toward unpleasant thoughts and feelings. The remaining six items did not load on any factor or showed low to moderate loadings on more than one factor.

A two-factor solution was examined next. Findings were similar. One additional item joined the *Observing* factor (for a total of 9 *observing* items). The second factor included 10 items reflecting awareness of ongoing activity as well as judgmental or avoidant responses to thoughts and feelings. The remaining six items again did not load clearly on either factor.

Subsequent to collection of the data reported here, emerging research on assessment of mindfulness skills in adults (Baer et al., 2006, 2008) reported that the *Observing* Scale of the FFMQ showed inconsistent patterns of correlations with other variables. Because mindfulness is often described as an adaptive set of skills, facets of mindfulness are predicted to correlate positively with adaptive characteristics and negatively with maladaptive ones. However, Baer et al. (2006) found that *observing* was positively associated with emotional intelligence and self-compassion (as expected) but also was positively associated with psychological symptoms, dissociation, and thought suppression. A subsequent study (Baer et al., 2008) showed that relationships between *observing* and other constructs vary with meditation experience. In meditators, *observing* is clearly associated with psychological health, whereas in nonmeditators *observing* is either unrelated to psychological health or is associated with distress or dysfunction.

This complex pattern of relationships with other variables raises questions about the utility of *observing* items for measuring mindfulness in youth, a population with little meditation experience. Therefore, before proceeding with inclusion of the *observing* items in the CAMM, we examined internal consistency of the 9 *observing* items identified here, along with correlations between this scale and several other variables. Coefficient alpha for the *Observing* scale was .77 (adequate). Consistent with previous findings in adults, correlations with other constructs were mixed. *Observing* was positively correlated with teacher-rated social skills, suggesting that, in youths, *observing* can be adaptive. However, *observing* also was positively correlated with thought suppression and somatic complaints, and nonsignificantly correlated with internalizing and externalizing symptoms, suggesting that *observing* also can be maladaptive or neutral. (More detailed descriptions of these measures are provided in Study 4.) These data suggested that high levels of *observing* are not necessarily consistent with mindfulness in this population, probably because present-moment observation can be open and accepting (consistent with mindfulness) or can be judgmental and reactive (inconsistent with mindfulness; Baer et al., 2006, 2008). Therefore, these nine *observing* items were dropped from consideration for inclusion in the CAMM.

The remaining 16 items from the original CAMM pool were subjected to another EFA, again with principal axis factoring and oblique rotation. Although five factors had eigenvalues greater than 1, only two of these factors had three or more items with loadings greater than .35, suggesting that the other factors may not be meaningful. The scree plot was most consistent with a single-factor solution but also suggested that a two-factor solution might be plausible. The analysis was run again, specifying that two factors be identified. The first factor included eight items with loadings over .40 and substantially lower loadings on the other factor. These items reflect awareness of ongoing activity and nonaccepting, judgmental responses to thoughts and feelings. The second factor included only three items, all reflecting an avoidant stance toward unpleasant thoughts and feelings. The remaining five items did not load on either factor or showed low or moderate loadings on both factors.

A single-factor solution was examined next. Ten of the 16 items had loadings greater than .40 on this single factor. Their content covers lack of present-moment awareness as well as judgmental and nonaccepting responses to thoughts and feelings. The single-factor solution was preferred for two reasons. First, the three-item factor identified in the previous solution was less likely to be reliable or stable across samples. Second, the content of the three-item factor was not readily distinguishable from the first factor, which also includes items describing a nonaccepting and judgmental stance toward thoughts and feelings. Therefore, the two-factor solution was rejected in favor of the 10-item, single-factor solution. Internal consistency (coefficient alpha) of this 10-item scale was .80. Content and factor loadings for these 10 items are presented in Table 1.

Study 3: CFA

In Study 3 the single-factor structure identified in the preceding analyses was subjected to confirmation on the cross-validation sample using CFA.

Table 1
Item Content and Factor Loadings for the Child and Adolescent Mindfulness Measure (CAMM)

Item	Factor loading
1. I get upset with myself for having feelings that don't make sense.	.53
2. At school, I walk from class to class without noticing what I'm doing.	.43
3. I keep myself busy so I don't notice my thoughts or feelings.	.60
4. I tell myself that I shouldn't feel the way I'm feeling.	.53
5. I push away thoughts that I don't like.	.45
6. It's hard for me to pay attention to only one thing at a time.	.42
7. I think about things that happened in the past instead of thinking about things that are happening right now.	.46
8. I get upset with myself for having certain thoughts.	.58
9. I think that some of my feelings are bad and that I shouldn't have them.	.66
10. I stop myself from having feelings that I don't like.	.55

Method

Participants and procedures. Study 3 used the cross-validation sample described earlier, consisting of 332 youths (57.5% girls) with a mean age of 12.77 years ($SD = 1.11$ years, range = 10–16). The sample was 78% Caucasian, 14.5% African American, 3% Hispanic, 1.5% Native American, 1% Asian American, and 2% of other or unknown ethnicities. Participants completed the CAMM in school settings as previously described.

We ran confirmatory tests of the factorial validity of the CAMM to see how well the hypothesized single-factor model fit the data. Single-factor measurement models were estimated using MPLUS 4.2 (Muthén & Muthén, 2004) with Satorra and Bentler's (2001) scaled estimates to reduce the impact of nonnormality. For an investigator to make an overall judgment of model fit, several fit indices typically are considered, and models are judged to fit well when most of the fit index values are consistent with good fit. We report results for two absolute fit indices: the root-mean-square error of approximation (RMSEA), which reflects discrepancy between the covariances implied by the model and the observed covariances per degree of freedom, and the standardized root-mean-square residual (SRMR), which reflects the average discrepancy between the correlation matrices of the observed sample and the hypothesized model; and two relative fit indices: the comparative fit index (CFI) and the nonnormed fit index (NNFI), both of which are based on a comparison of the chi-square value for the model with the chi-square value for a baseline model in which all variables are independent. General guidelines are that CFI and NNFI values of .90 or greater suggest good fit; RMSEA values of .05 or lower suggest excellent fit, values of .08 or lower suggest good fit, and values of .10 or lower suggest marginal fit; and SRMR values of .09 or lower reflect good fit (Browne & Cudeck, 1993; Kline, 2005).

When factor models use many indicators, as was the case in the present study (in which we used 10 separate item indicators of the overall factor), the absolute fit indices continue to perform well, while the relative fit indices tend to decrease, even for well-fitting models (Cook, Kallen, & Amtmann, 2009; Kenny & McCoach, 2003; Marsh, Hau, Balla, & Grayson, 1998). We therefore emphasize the absolute fit indices for model evaluation.

Results and Discussion

Both of the absolute fit indices showed that the single-factor model fit the data well: RMSEA = .07 (good fit) and SRMR = .06 (good fit). Of the relative fit indices, one showed good fit (CFI = .90), and the other fell somewhat short of the criterion for good fit (NNFI = .87). This pattern is consistent with the findings of Kenny and McCoach (2003), who reported that, even in correctly specified models with strong absolute fit index values, relative fit indices, particularly the NNFI, tend to decrease when there are many items (more than five or six). Our fit values are quite supportive of the single-factor structure.

Study 4: Convergent and Incremental Validity

Study 4 ($N = 319$) used an independent sample to examine validity coefficients for the final 10-item version of the CAMM. Consistent with findings in adult clinical and community samples,

we expected scores on the CAMM to correlate positively with favorable outcomes such as quality of life, academic competence, and social skills. Conversely, we expected scores on the CAMM to correlate negatively with adverse outcomes (e.g., somatic complaints, internalizing symptoms, externalizing behavior) and maladaptive clinical processes (i.e., thought suppression and psychological inflexibility). To determine whether the CAMM measures anything unique, we computed partial correlations, controlling for the effects of thought suppression and psychological inflexibility.

Method

Participants and procedures. Participants were 319 children and adolescents (59% girls) in Grades 5–10 who were recruited from two public schools in middle Tennessee using data collection procedures described above (classroom participation rates = 77%–94%; $M = 86\%$). The sample was 81% Caucasian, 12% African American, and 7% of other or unknown ethnicities. Their mean age was 12.68 years ($SD = 1.66$; range = 10–17 years). Self-reports were used to assess somatic complaints, internalizing symptoms, externalizing behavior problems, quality of life, psychological inflexibility, and thought suppression. Teacher reports were used to assess children's social skills, problem behavior, and academic functioning. Participants in Study 4 were given \$10 gift cards for their time and effort, and teachers were paid \$2.00 for every questionnaire they completed.

Measures of symptoms and functioning.

Children's Somatization Inventory-Short Form (CSI-SF; Walker & Garber, 2001). The CSI-SF uses 18 items to assess the extent to which children experience physical symptoms and somatic complaints, including headaches, stomachaches, dizziness, and fatigue. The CSI-SF has good concurrent and predictive validity and discriminates between children with and without chronic or recurrent pain conditions. Mean score on the CSI-SF was 16.53 ($SD = 12.03$; $\alpha = .82$).

Symptoms and Functioning Scale (SFS; Bickman, 2006). The SFS is a 33-item measure of internalizing symptoms (e.g., depression, anxiety) and externalizing symptoms (e.g., conduct problems, oppositional behavior, hyperactivity). The SFS has been found to have good internal consistency and convergent validity (Bickman, 2006). In the current sample, the mean internalizing score was 33.76 ($SD = 11.68$; $\alpha = .90$), and the mean externalizing score was 40.54 ($SD = 12.59$; $\alpha = .91$).

Youth Quality of Life-Revised (YQOL-R; Edwards, Huebner, Connell, & Patrick, 2002; Patrick, Edwards, & Topolski, 2002). The YQOL-R is a 41-item instrument that assesses life quality and well-being across multiple domains, including personal and self-fulfillment, peer relationships, family, and school. The YQOL-R total score has been found to have good concurrent and discriminant validity (Patrick et al., 2002). Total score on the YQOL-R was used as an overall index of life quality and well-being ($M = 303.90$; $SD = 70.97$; $\alpha = .91$).

Mindfulness and related processes.

CAMM. The 10-item version of the CAMM is used to assess present-moment awareness and nonjudgmental, nonavoidant responses to thoughts and feelings. Mean score on the CAMM was 22.73 ($SD = 7.33$), with a Cronbach's alpha of .81.

AFQ-Y (Greco, Lambert, & Baer, 2008). The AFQ-Y uses 17 items to assess psychological inflexibility engendered by cog-

nitve fusion (e.g., "The bad things I think about myself must be true") and experiential avoidance (e.g., "I try hard to erase hurtful memories from my mind"). The AFQ-Y has shown good internal consistency and convergent validity correlations (Greco, Lambert, et al., 2008). The mean score on the AFQ-Y was 22.61 ($SD = 13.32$), with a Cronbach's alpha of .88.

White Bear Suppression Inventory (WBSI; Wegner & Zanakos, 1994). The WBSI is a 15-item measure of thought suppression and control (e.g., "There are things that I try not to think about"; "I have thoughts that I cannot stop"). The WBSI has been used to measure thought suppression in school-aged community samples (e.g., Laugesen, Dugas, & Bukowski, 2003) and has been found to have good internal consistency and concurrent validity in both youth and adult samples (Greco, Lambert, et al., 2008; Laugesen et al., 2003; Muris, Merckelbach, & Horselenberg, 1996). The mean score on the WBSI was 50.84 ($SD = 11.23$), and Cronbach's alpha was .86.

Teacher report measures.

Social Skills Rating System—Teacher Form (SSRS-TF; Gresham & Elliot, 1990). Teachers completed the SSRS-TF, composed of a 30-item Social Skills Scale assessing cooperation, assertion, and self-control; an 18-item Problem Behavior Scale assessing hyperactivity, oppositional behavior, and internalizing symptoms; and a nine-item Academic Competence Scale reflecting children's performance in several academic areas. Research suggests good 2-month test-retest reliability and criterion validity for all three SSRS-TF subscales (Gresham & Elliot, 1990). Respective mean scores and standard deviations were 48.29 ($SD = 11.59$) on the Social Skills Scale, 6.15 ($SD = 6.86$) on the Problem Behavior Scale, and 33.02 ($SD = 8.96$) on the Academic Competence Scale. Coefficient alphas on these subscales ranged from .92 to .94.

Results and Discussion

Total scores on the CAMM were computed by summing the responses to the 10 items, yielding a possible range of 0–40. Means and standard deviations are shown in Table 2. Mean differences for sex, race, and grade in school were not significant. The correlation between age and CAMM total score also was not significant.

Table 2
Means and Standard Deviations for the Child and Adolescent Mindfulness Measure (CAMM) by Sex, Race, and Grade in School ($N = 319$)

Demographic variable	<i>n</i>	<i>M</i>	<i>SD</i>
Sex			
Boys	131	23.27	7.28
Girls	188	22.43	7.36
Total sample	319	22.73	7.33
Race			
Caucasian	258	23.37	7.10
African American	38	20.67	7.75
Other	23	21.71	7.99
Grade in school			
Grades 5–6	167	22.29	7.15
Grades 7–8	95	23.22	7.41
Grades 9–10	57	24.52	7.50

Correlations were computed between the CAMM and measures of other relevant constructs. In addition to zero-order correlations, partial correlations were computed controlling for the related processes of thought suppression and psychological flexibility as measured by the WBSI and AFQ–Y, respectively. These latter analyses examine whether the CAMM accounts for significant variance in relevant variables after controlling for the effects of closely related processes.

As shown in Table 3, CAMM scores were negatively correlated with child-reported somatic complaints, internalizing symptoms, and externalizing behavior problems and positively correlated with overall quality of life. These relationships were small to moderate by Cohen's (1992) standards, suggesting (as expected) that the CAMM is related to but not redundant with these variables. CAMM scores were also significantly and negatively correlated with the closely related processes of thought suppression and psychological inflexibility. Correlations with teacher ratings of social skills, problem behaviors, and academic competence were significant and in the expected directions but were notably smaller.

When controlling for thought suppression, partial correlations were somewhat reduced but still significant at $p < .01$. When controlling for psychological inflexibility, most of the correlations were small but significant, suggesting that the CAMM accounts for important variance in many aspects of psychological functioning after accounting for the closely related processes of thought suppression and psychological inflexibility (see Table 3).

General Discussion

This article describes the development and initial validation of the Child and Adolescent Mindfulness Measure (CAMM). Overall, the CAMM appears to be a developmentally appropriate measure with adequate preliminary evidence for the reliability and validity of its scores. Similar to research in adult samples, scores on the CAMM correlated significantly and positively with favorable outcomes such as quality of life and academic competence and negatively with adverse outcomes such as internalizing symp-

tom and externalizing behavior problems. As predicted, scores on the CAMM correlated negatively with the overlapping and maladaptive processes of thought suppression and psychological inflexibility. Correlational findings generally held after controlling for the effects of thought suppression and psychological inflexibility, providing further support for the construct and incremental validity of CAMM scores.

This article is among the first to describe the development and validation of a child-report measure of mindfulness skills, thereby filling an important gap in the empirical clinical literature on mindfulness. Strengths of this work include the use of expert and child feedback to guide item development, as well as the multi-method statistical approach used to develop, refine, and validate the CAMM in multiple samples. Most of our findings are consistent with those reported in adult samples. However, although the adult literature suggests that mindfulness is a multifaceted construct with several distinct though intercorrelated elements that can be measured separately (acting with awareness, nonjudging, etc.), our analyses yielded a single-factor instrument. This may be due to the elimination of the *observing* items and the decision not to include any *describing* items for developmental reasons explained earlier. The remaining items load on a single factor, perhaps suggesting that these skills are less distinct in youths than in adults.

A number of limitations should be considered when planning for future research. First, it will be useful to investigate the psychometric properties of the CAMM in more diverse samples, as this research focuses largely on Caucasian youths residing in middle-class to lower middle-class neighborhoods. In addition, findings reported herein rely primarily on child self-report measures. Teacher reports were used to assess some aspects of child functioning; however, these correlations were smaller, possibly due to the effects of shared method variance when self-report measures are correlated. It is possible that the mindfulness skills assessed by the CAMM are more internal in nature—for example, items such as “I get upset with myself for having feelings that don't make sense” and “I keep myself busy so I don't notice my thoughts or

Table 3
Zero-Order and Partial Correlations Between the Child and Adolescent Mindfulness Measure (CAMM) and Other Variables

Measure	Zero-order correlation	Partial correlation (control for WBSI)	Partial correlation (control for AFQ–Y)
Child report: Symptoms and functioning			
Somatization (CSI)	-.40**	-.33**	-.21**
Internalizing symptoms (SFS)	-.50**	-.37**	-.18**
Externalizing symptoms (SFS)	-.37**	-.32**	-.19**
Quality of life (YQOL)	.25**	.17**	-.04
Child report: Mindfulness-related processes			
Thought suppression (WBSI)	-.58**	—	-.37**
Psychological inflexibility (AFQ–Y)	-.60**	-.45**	—
Teacher report on SSRS			
Social skills	.14*	.14*	.05
Problem behavior	-.22**	-.22**	-.15*
Academic competence	.25**	.28**	.17*

Note. CSI = Children's Somatization Inventory; SFS = Symptoms and Functioning Scale; YQOL = Youth Quality of Life Inventory; WBSI = White Bear Suppression Inventory; AFQ–Y = Avoidance and Fusion Questionnaire for Youth; SSRS = Social Skills Rating Scale.

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

feelings” reflect low levels of mindful acceptance and may be difficult for outside observers to detect. It will be important for future research to examine parent and teacher reports of children’s and adolescents’ mindfulness skills, as well as other more objective methodologies used to assess mindfulness such as behavioral observation and neurobiological assessment.

Future research is also needed to examine the sensitivity of the CAMM in detecting treatment effects, as well as its usefulness as a tool for identifying mechanisms of change. For example, do youth who participate in mindfulness-based interventions actually report higher levels of mindfulness skills as measured by the CAMM, and does this increase in mindfulness skills mediate treatment outcome? Another direction for future research is to examine whether meditation experience is associated with differing interpretations of the meaning of items. As noted earlier, previous research with adults suggests that *observing* subscales appear to function differently in meditators than in nonmeditators. Although the Observing factor was dropped from the CAMM due to inconsistent correlations with other variables, it will be important for future research to examine whether the remaining items show differential relationships with other variables in youth who have participated in mindfulness training compared with those who have not.

A potential concern about the CAMM is that all of the items are reverse scored. Research on the assessment of other variables has sometimes suggested that reverse-scored items may not measure exactly the same construct as do directly worded items (Reise & Waller, 2009). However, findings are mixed. For example, Rodebaugh, Woods, and Heimberg (2007) reported that reverse-scored items detracted from the psychometric performance of a measure of social anxiety. In contrast, Hazlett-Stevens, Ullman, and Craske (2004) reported that reverse-scored items did not compromise the validity of scores from a widely used measure of worry. The utility of reverse-scored items may vary with the construct being measured. Brown and Ryan (2003) reported that, in the development of the Mindful Attention Awareness Scale (MAAS), reverse-scored items were more psychometrically sound than were positively worded items. As a result, the MAAS is entirely negatively worded. Similarly, Baer et al. (2004), in the development of the KIMS, reported that positively worded items for the Accept Without Judgment subscale had to be eliminated due to poor item-total correlations. Only reverse-scored items were retained for this subscale. Thus, it is possible that some mindfulness skills are more reliably assessed with reverse-scored items. Research on mindfulness questionnaires for adults shows considerable evidence in support of the validity of the scores, regardless of items’ scoring direction. Only future research can determine whether a measure for youth would show stronger psychometric properties with directly worded rather than reverse-scored items.

The continuing adaptation of acceptance- and mindfulness-based interventions for child and adolescent populations presents a critical need for self-report and more objective methodologies to assess mindfulness skills and related processes such as psychological acceptance and self-compassion. We hope that the availability of the CAMM will stimulate work in this area and will serve as an impetus for future research examining the nature and role of mindfulness in children and adolescents.

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