The Anger Expression Scale for Children: Initial Validation among Healthy Children and Children with Cancer

Ric G. Steele,[1] PhD, ABPP, John-Paul Legerski,[1] MA, Timothy D. Nelson,[1] MA, and Sean Phipps,[2] PhD
[1]*University of Kansas, Clinical Child Psychology Program and* [2]*St. Jude Children's Research Hospital*

Objective To evaluate the proposed structure of the Anger Expression Scale for Children (AESC) in samples of healthy children and those with cancer, and to examine correlations between AESC subscales and other indicators of anger and hostility. **Method** A total of 803 children from two independent studies of healthy and ill children (mean age = 12.7, *SD* = 3.1) completed the AESC and other measures of anger expression and hostility, and a sub-sample of 298 of their parents completed measures of anger expression and hostility. **Results** Results provided initial support for the proposed four-factor model of the AESC (Trait Anger, Anger Expression, Anger In, and Anger Control). Measurement invariance was established across groups using a series of nested tests. Correlations between AESC subscales and parent- and child-reported indices of anger, hostility, and aggression support the convergent validity of the scales. **Conclusions** Analyses supported the construct validity of the AESC and generalization of the factor structure across healthy and chronically ill children.

Key words anger expression; childhood cancer; measurement.

The propensities to become angry and to express anger have been identified as important factors in physical and psychological health in children and adults (Broman & Jackson, 1988; Kerr & Schneider, 2008). As reviewed by Kerr and Schneider, anger expression in children has been associated with a number of negative health and mental health outcomes, including elevated blood pressure, psychosomatic symptoms, poor perceived health, depression, aggression, and externalizing problems (Hagglund et al., 1994; Hauber, Rice, Howell, & Carmon, 1998; Jacobs, Phelps, & Rohrs, 1989; Kashani, Dahlmeier, Borduin, Soltys, & Reid, 1995). Although the literature on anger expression and outcomes in children is still in its infancy, these relatively early findings are consistent with the larger literature on adult anger expression (Bongard, al' Absi, & Lovallo, 1998; Deffenbacher, Oetting, Lynch, & Morris, 1996; Penedo et al., 2006).

One reason for the relative paucity of empirical research on anger in the context of pediatric health may be the lack of adequate instruments to measure children's expression of anger (Hagglund et al., 1994). Our own search for an anger expression scale to use with children revealed several limitations within the existing body of anger expression inventories for children, including low to moderate estimates of internal consistency, low item-total correlations, unstable factor structures across samples, limited assessment of suppression or nonexpression of anger, and developmentally inappropriate wording (see Kerr & Schneider, 2008, for a complete review of anger expression inventories for children). Recognizing the importance of the work that has been conducted in the measurement of anger expression in children, Kerr and Schneider called for additional research to address some of the limitations in the anger assessment literature. Indeed, they noted, ''further exploration of anger expression in children would likely provide information useful in predicting and hopefully changing the course of psychopathology and general illness across the life span'' (p. 17).

Despite the health-related variables associated with anger expression in children, only one existing measure of children's anger expression has been examined in the context of pediatric chronic illness: the Pediatric Anger Expression Scale-3rd Edition (PAES-III; Jacobs et al., 1989). After the initial development of the PAES-III in a healthy sample (Jacobs et al., 1989), Hagglund and colleagues (1994) administered the PAES-III to children with

All correspondence concerning this article should be addressed to Sean Phipps, PhD, Division of Behavioral Medicine, St. Jude Children's Research Hospital, 332 N. Lauderdale, Memphis, TN 38105, USA. E-mail: sean.phipps@stjude.org

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juvenile rheumatoid arthritis (JRA; $n = 40$), diabetes mellitus (DM; $n = 26$), and healthy children (HC; $n = 58$). Results failed to demonstrate significant differences in the levels of anger expression for the three scales (Anger In, Anger Out, and Anger Control) across diagnostic groups. Results also indicated only modest estimates of internal consistency, and the sample size prevented examination of factorial invariance across illness groups. The lack of a test of factorial invariance is particularly problematic for studies that seek to examine correlates and outcomes of anger expression across illness groups (Brown, 2006; Kline, 2005).

In order to address some of the limitations in the literature noted above, and to allow further examination of children's anger expression in the context of illness, the Anger Expression Scale for Children (AESC) was developed. The instrument was designed to allow meaningful and valid comparisons of anger and anger expression across HC and children with chronic illnesses. Measurement of anger expression in pediatric samples may be particularly important because of the known health-related correlates of anger and hostility in both children and adults (see Kerr & Schneider, 2008, for a review). The measurement of anger control may be particularly important as well, because at least one investigation has found significant associations between anger suppression and immune functioning in adults with cancer (Penedo et al., 2006).

Following the constructs identified in the State-Trait Anger Expression Inventory (STAXI; Forgays, Forgays, & Spielberger, 1997; Spielberger, 1988), the AESC was designed around four a priori scales designed to measure trait anger, anger expression (comparable to anger-out in the STAXI model), anger in, and anger control (see Spielberger, 1988 for further review of these four anger constructs). The present analyses included confirmatory factor analyses (CFAs) to evaluate the goodness-of-fit of the proposed structure of the AESC, as well as to demonstrate the factorial invariance and construct validity of the measure in two populations: HC and children with cancer (CAN). Following the CFAs, multivariate analyses of variance and covariance (MANOVAs and MANCOVAs) were conducted to examine scale-level group differences, and correlational analyses were conducted to examine the test–retest stability and concurrent validity of the AESC.

Method

Participants

The data for the present analyses were collected as part of two larger studies designed to examine correlates of adaptive style in HC and children with chronic illnesses.

Sample 1

Data from the first sample were collected from HC and children with chronic illnesses. For the HC in this sample, a letter explaining the purpose of the study was distributed by teachers in designated classes and sent home with students for parental consent. For the HC, eligibility criteria included the following: (a) child age between 7 and 17 (inclusive), (b) child speaks and reads English, (c) no history of chronic or serious illness by parental report, (d) no known cognitive or sensory impairments that would preclude participation, and (e) parental consent and child assent. Students who returned the letter with parental signature were eligible for the study. Using this procedure, data were obtained from 362 HC, representing just under half (48.6%) of the 745 letters of request that were distributed. This represents an approximate rate of participation, since due to student absences, an exact percentage of refusals could not be calculated.

Children with chronic illnesses [cancer, $n = 131$; diabetes, $n = 49$; cystic fibrosis (CF), $n = 29$; and JRA, $n = 42$] were recruited from one of two major children's hospitals in the Southeast region of the US. Participants in this group were contacted during routine visits to their specialty clinics or (in the case of children admitted as inpatients) in their hospital rooms. Eligibility criteria included the following: (a) child age between 7 and 17 (inclusive), (b) child speaks and reads English, (c) no known sensory or cognitive impairments that would prevent participation, and (d) parental consent and child assent. In order to obtain parental consent for participation, research assistants approached parents at random from lists of eligible children. The purpose and requirements of the study were explained and informed consent obtained according to institutional IRB and APA guidelines. Of the 270 children approached, 251 (93%) agreed to participate.

Sample 2

Data from the second sample were obtained from children and their parents enrolled in a separate study. Participants included children being treated for cancer and their parents and HC with no known serious illnesses and their parents. Recruitment and enrollment procedures and eligibility criteria for the CAN mirrored the strategies noted above for Sample 1. Out of 339 child/parent dyads with cancer approached, 249 (73%) agreed to participate and were initially enrolled. However, 35 returned partially complete measures and 15 withdrew before completing all materials, leaving a sample of 199 fully evaluable patient participant dyads.

HC in this sample were recruited through an ''acquaintance control'' methodology. Cancer patients

recruited to the study were asked to identify up to three friends from their home neighborhood or school who were within ±2 years of the age of the patient. These friends were provided information about the study and invited to participate. Eligibility criteria included (a) child age between 7 and 17 (inclusive), (b) child speaks and reads English, (c) no history of chronic or serious illness by parental report, and (d) parental consent and child assent. Data from those agreeing to participate were obtained through the mail, with telephone assistance where necessary. Survey packets were sent to 297 potential control participants and complete information was received back from 111 (37%). Control group parents were contacted by telephone, and, after confirming that the index child met inclusion criteria, informed consent was obtained by telephone. Questionnaire packets were then mailed to participants, completed at home and returned.

Because the relatively small numbers of children with noncancer diagnoses in Sample 1 (e.g., diabetes, CF, and JRA) would not allow meaningful inferences about the properties of the AESC in these populations, we included only children with CAN diagnoses in the present analyses. Further, a test of factorial invariance across the two groups (i.e., HC, CAN) requires roughly equivalent sample sizes for the groups to ensure accurate interpretation of results (Brown, 2006). Because of this, only the participants with cancer from Sample 2 were used in the CFA.

Thus, the total number of participants whose data were eligible for inclusion in the CFA was 692 (362 HC and 131 CAN from Sample 1, and 199 CAN from Sample 2). Preliminary analyses indicated no significant differences between samples in terms of age ($p = .07$), distribution of gender ($p = .23$) or proportion of African Americans ($p = .63$). However, within both samples, there were significantly fewer females in the cancer groups relative to the healthy groups (Sample 1 $\chi^2 = 18.92$, $p < .01$; Sample 2 $\chi^2 = 3.96$, $p < .05$). Further, the proportion of African Americans in the cancer groups was significant greater than the proportion of African Americans in the healthy groups (Sample 1 $\chi^2 = 6.58$, $p < .01$; Sample 2 $\chi^2 = 9.33$, $p < .01$).

Of the 692 included in the CFA, 31 participants in the study had missing data. List-wise deletion was used to adjust for missing variables, reducing the number of participants in the CFA to 661 (95.5% of the sample). Demographic characteristics for the two samples are presented in Table I.

Measures

AESC

The AESC is a 26-item paper-and-pencil measure that utilizes a four-point Likert response format (*almost never, sometimes, often*, and *almost always*) with higher values keyed to greater endorsement of the items (see Appendix for full measure). Items for the AESC were generated by the fourth author (S.P.) in collaboration with group of pediatric psychologists and psychology trainees. Based on a review of the extant literature on child anger, including available anger expression scales (e.g., PAES-III; Jacobs et al., 1989; STAXI; Spielberger, 1988), a list of potential items was generated to reflect trait anger and characteristics of anger expression and control (Anger Expression/Out, Anger In/Hostility, Anger Control/Suppression). Group consensus was sought regarding the best items and wording to capture these constructs.

For the items designed to indicate trait anger, children received the following instructions:

> Below are a number of statements which children and adults sometimes use to describe themselves. Read each statement and circle the number that describes you best.

Table I. Demographic Information of Participants by Sample

	Sample 1 ($n = 493$)		Sample 2 ($n = 310$)	
	Healthy ($n = 362$)	Cancer ($n = 131$)	Healthy ($n = 111$)	Cancer ($n = 199$)
Mean age (*SD*)	12.76 (2.85)	13.08 (3.11)	12.43 (3.05)	12.32 (3.43)
Gender				
Female (%)	62.4	40.8**	58.2	47.7**
Ethnicity (%)				
European-American	82.0	74.6	90.1	76.4
African-American	12.4	22.3**	5.4	19.6*
Other	3.9	3.1	1.8	4.0
Not reported/missing	1.7	0.0	2.7	0.0

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

For items intended to measure anger expression, anger in, and anger control, children received the following instructions:

> Everyone feels angry from time to time, but people differ in how they act when they are angry. Below are some statements that people use to describe themselves and how they act when they feel angry. Read each statement carefully, and decide how often the statement applies to you when you feel angry.

Designed for use among children and adolescents aged 7 through 17, the AESC demonstrated an estimated grade reading level (Flesch-Kincaid) of 2.1.

Children's Inventory of Anger (ChIA)
This 39-item measure (Nelson & Finch, 2000) was designed to provide an assessment of children's anger reactions, including the frequency, intensity, and duration of the anger response as well as the mode of expression and effect on personal relationships. The ChIA was developed for use with children between the ages of 8 and 16, and has been evaluated in samples ranging from ages 6 to 13 years (Flanagan & Allen, 2005). It yields a total score and four subscale scores: frustration, physical aggression, peer relationships, and authority relations. Only the total score was used for the present analyses. Internal reliability for the total scale is reportedly high ($\alpha = .95$; subscale coefficients ranged from .85 to .87), and the 1-week test–retest reliability was .75 (Nelson & Finch, 2000).

Cook–Medley Hostility Scale, children's version (CMHS)
The CMHS (Cook & Medley, 1954; Woodall & Matthews, 1993) is an empirically derived scale from the MMPI, which has become one of the most widely used measures of hostility in adults. The instrument has been modified for use with adolescents and children (ages 10–18; Woodall & Matthews, 1993). This involved reducing the length from 50 to 23 items, and rewording many of the items to be more understandable for children (Woodall & Matthews, 1993). The child instrument has been used in both a true–false and four-point Likert format, with similar psychometric properties for both, including internal consistency reliabilities ranging from .75 to .81 (Woodall & Matthews, 1993; Liehr et al., 2000). We utilized the four-point response format version of the measure.

Behavior Assessment Scale for Children–Parent Report Form (BASC-PRF)
The BASC-PRF (Reynolds & Kamphaus, 1992) is a parent-report questionnaire that assesses multiple emotional and behavioral domains of children and adolescents ages 6 through 18. Consistent with the self-report measure, scale scores represent pathological and adaptive characteristics that deviate from standardized means. The reliability and validity of the BASC-PRF are well established (Sandoval & Echandia, 1994). Although the entire BASC was administered to parents of children in the study, only the Aggression subscale score (i.e., *T*-score generated from the general normative sample) of the parent-report instrument was used in the present analyses.

Children's Hostility Inventory (CHI)
The CHI (Kazdin, Rodgers, Colbus, & Siegel, 1987) is a parent-report measure of hostility and aggression in children (ages 6–12; Kazdin et al., 1987). It is made up of seven subscales (Assaultiveness, Irritability, Negativism, Indirect Hostility, Resentment, Suspicion, and Verbal Hostility), which fall into two factor-analytically derived domains: Aggression and Hostility. The authors report that the scale has good internal consistency ($\alpha = .82$), and the Aggression and Hostility domains correlate significantly with measures of externalizing and internalizing symptoms, respectively (Kazdin et al., 1987). Only the Aggression, Hostility, and total scores were used for the present analyses.

Procedure

Recruitment strategies varied slightly across the two projects from which these data were drawn. All participants who met eligibility criteria for the respective projects and were interested in participation were provided information and given the opportunity to ask questions and to provide informed consent (or, for children, assent). Assenting child participants completed measures individually or in classroom settings. Parents completed measures individually. For children recruited through primary schools, the items were read aloud by a research assistant, and additional research assistants were available to help individual children as needed. The middle and high school participants completed the measures on their own. For the cancer and other chronically ill groups, data were obtained in clinics individually with a research assistant available for assistance. Healthy participants who were recruited through the ''acquaintance control'' method completed measures at home and returned these by mail. Consenting parents/caregivers completed measures individually. All procedures were approved by the IRBs of the participating institutions.

Results

Preliminary Analyses

Before conducting a CFA on the measure, item–total correlations for each item were calculated. Items that did not

Table II. Standardized Loadings, Residuals, and R^2-Values for Each Item, and the Estimated Latent Variances from the Strong Metric Invariance Model for HC and Those with Cancer

Item	Standardized Loading[a]	Group: Healthy Θ	Group: Healthy R^2	Group: Cancer Θ	Group: Cancer R^2
Trait anger: Estimated latent variance (Healthy = 1.00; Cancer = 0.66)					
1. I feel angry	0.54	.67	.33	.72	.26
2. I feel like yelling at someone	0.56	.68	.32	.70	.30
4. I get very impatient if I have to wait for something	0.46	.79	.21	.79	.32
5. I lose my temper easily	0.72	.47	.53	.49	.50
6. I feel like breaking things	0.43	.85	.15	.73	.27
7. I feel grouchy or irritable	0.54	.69	.31	.69	.31
8. I get in a bad mood when things don't go my way	0.59	.64	.36	.67	.33
10. I have a bad temper	0.67	.53	.47	.58	.42
11. I get very angry if my parent or teacher criticizes me	0.34	.86	.14	.86	.14
12. I get in a bad mood easily	0.70	.55	.45	.64	.41
Anger expression: Estimated latent variance (Healthy = 1.00; Cancer = 0.38)					
13. I slam doors or stomp my feet	0.57	.72	.28	.61	.39
16. I let everybody know it	0.41	.82	.18	.85	.15
19. I argue or fight back	0.59	.68	.32	.63	.37
22. I hit things or people	0.47	.80	.20	.76	.25
25. I say mean or nasty things	0.55	.73	.27	.67	.35
28. I have a temper tantrum	0.44	.80	.20	.81	.19
Anger in: Estimated latent variance (Healthy = 1.00; Cancer = 1.43)					
14. I keep it to myself	0.67	.48	.52	.63	.37
23. I feel it inside, but I don't show it	0.63	.55	.45	.66	.34
26. I stay mad at people but keep it secret	0.25	.94	.07	.94	.06
29. I hold my anger in	0.78	.31	.70	.49	.51
Anger control: Estimated latent variance (Healthy = 1.00; Cancer = 1.31)					
15. I control my temper	0.73	.50	.50	.43	.56
28. I try to be patient	0.64	.60	.40	.55	.44
21. I keep my cool	0.75	.47	.53	.40	.60
24. I stay well behaved	0.67	.57	.43	.53	.47
27. I try to stay calm and settle the problem	0.67	.56	.44	.53	.47
30. I try to control my angry feelings	0.64	.62	.38	.54	.46
Items excluded from CFA					
3. I'm easygoing and don't let things bother me					
9. It takes a lot to get me upset					
17. I pout or sulk					
20. I don't talk to anybody					

Item numbers reflect order of administration.

[a]Common Metric Completely Standardized Solution.

correlate at .30 or greater were eliminated from consideration. Four items (Table II) were removed as a result of this analysis. The resulting 26-item set consisted of items intended to assess Trait Anger (10 items), Anger Expression (6 items), Anger In (4 items), and Anger Control (6 items).

CFA

CFA procedures were conducted using LISREL 8.72 (Jöreskog & Sörbom, 2005). First, the hypothesized four-factor model was compared to an alternative three-factor model in a nested comparison using the entire CFA sample ($n = 661$). Second, after determining the best-fitting model, that model was tested for measurement invariance across HC and CAN.

The nested comparison was conducted by evaluating sequential CFAs using four- and three-factor models. The four-factor model was evaluated first and demonstrated good fit, χ^2 (293, $n = 661$) = 984.710, $p < .001$; comparative fit index (CFI) = 1.00; non-normed fit index (NNFI) = 1.03; root mean square error of

approximation (RMSEA) = .060 (CI_{90} = .056–.064). Next, an alternative three-factor model was evaluated by constraining the latent correlation between Trait Anger and Anger Expression to 1.0, combining these into a single factor and resulting in a three-factor model that is nested in the hypothesized four-factor model. The three-factor model was selected as a competing model because of the potential theoretical overlap between the Trait Anger and Anger Expression factors (Brown, 2006). This alternative model also demonstrated good fit, χ^2 (29, $n = 661$) = 1397.558, $p < .001$; CFI = 1.00; NNFI = 1.03; RMSEA = .075 (CI_{90} = .072–.079). To directly compare these models, a χ^2-difference test was conducted (Steiger, Shapiro, & Browne, 1985) and indicated a significant degradation of model fit in the three-factor model, χ^2 (1) = 412.767, $p < .001$, indicating that the four-factor model represented a better fit for the data.

After identifying that the four-factor model fit the data, a series of analyses were conducted to test for measurement invariance across healthy and ill groups (Little, 1997). For the configural invariance test, the four-factor model was freely estimated for both groups (i.e., HC and those with cancer). This analysis indicated good to acceptable fit, χ^2 (586, $n = 661$) = 1300.6041, $p < .001$; CFI = 1.00; NNFI = 1.05; RMSEA = .061 (CI_{90} = .056–.065). Next, in order to test for loading invariance, the indicator loadings were equated across groups. No significant difference in model fit was found using the CFIΔ test (i.e., CFIΔ < .01; Cheung & Rensvold, 2002) or RMSEA model test (i.e., RMSEA of the nested model fell within the 90% confidence interval of the comparison model; Little, 1997). After establishing loading invariance, the test for strong invariance was performed by equating the intercepts and allowing the residual variances to freely vary across the two groups (Table II). The strong invariance test specifies whether the constructs in a model can be meaningfully compared across groups (i.e., predicting the same scores on a measured indicator for participants in separate groups at the same level of a construct; Little & Slegers, 2005). No significant difference in model fit was found using the CFIΔ test or RMSEA model test when conducting the strong invariance test, indicating that the four-factor structure of the AESC is invariant and can be meaningfully compared across the healthy and cancer groups.

Descriptive Statistics for the AESC

Next, descriptive statistical analyses of the AESC were conducted using all HC and CAN from the two samples ($n = 803$). Pair-wise deletion was used to adjust for missing variables, reducing the number of participants to between 759 and 774 participants (94.5% and 96.4% of the sample) for the various analyses. Means and standard deviations for the overall sample and various subsets of the sample are presented in Table III.

MANOVA indicated no significant differences on AESC subscales across gender, Wilks' $\lambda = .99$, $F(4,754) = .22$, $p > .90$. However, the MANOVA for ethnicity was significant, Wilks' $\lambda = .98$, $F(8,1504) = 2.35$, $p < .05$, $\eta^2 = .012$. Univariate analyses indicated significant differences across ethnic groups for Anger Control, $F(2,755) = 4.54$, $p < .05$, $\eta^2 = .012$, and Anger Expression, $F(2,755) = 4.17$, $p < .05$, $\eta^2 = .011$. Post hoc analyses indicated that African-American children self-reported higher scores on Anger Control ($p < .001$, Cohen's $d = .26$) and lower scores on Anger Expression ($p < .01$, Cohen's $d = .30$) than European-American children.

Table III. Means and Standard Deviations of AESC Subscales for Combined Sample and Demographic Subsets

	AESC subscale Trait anger	Anger expression	Anger in	Anger control
Overall sample ($n = 774$)	17.89 (5.20)	9.95 (3.04)	8.61 (2.90)	15.51 (4.51)
By gender				
Females ($n = 424$)	18.04 (5.47)	10.03 (3.04)	8.63 (2.96)	15.49 (4.41)
Males ($n = 350$)	17.71 (4.85)	9.86 (3.05)	8.58 (2.83)	15.52 (4.62)
By ethnicity				
European American ($n = 629$)	18.03 (5.14)[a]	10.12 (3.06)[a]	8.50 (2.85)[a]	15.29 (4.35)[a]
African American ($n = 111$)	17.59 (5.69)[a]	9.19 (3.01)[b]	9.18 (3.11)[a]	16.50 (5.08)[b]
Other ($n = 33$)	16.09 (4.00)[a]	9.33 (2.51)[a,b]	8.73 (2.85)[a]	16.42 (5.04)[a,b]
By illness type				
Healthy ($n = 459$)	18.52 (5.38)[a]	10.27 (3.06)[a]	8.88 (3.03)[a]	15.41 (4.42)[a]
Cancer ($n = 315$)	16.98 (4.79)[b]	9.50 (2.97)[b]	8.22 (2.64)[b]	15.64 (4.65)[a]

Within each column (i.e., subscale) and grouping variable (e.g., ethnicity) values that *do not* share a common superscript are significantly different ($p \leq .05$).

Because of unequal proportions of males and African Americans in the cancer groups of both samples, a MANCOVA (controlling for gender and ethnicity) was conducted to examine differences in mean AESC subscale scores across illness conditions (healthy vs. cancer). This MANCOVA indicated significant differences across illness groups, Wilks' $\lambda = .964$, $F(4,718) = 6.757$, $p < .001$, $\eta^2 = .036$. After controlling for ethnicity and gender, univariate analyses indicated significant differences across illness groups (cancer, healthy) for three of the AESC subscales: Trait Anger, $F(1,721) = 12.74$, $p < .001$, $\eta^2 = .017$; Anger Expression, $F(1,721) = 7.81$, $p < .01$, $\eta^2 = .011$; and Anger In, $F(1,721) = 13.81$, $p < .001$, $\eta^2 = .019$. Post hoc analyses indicated that HC self-reported greater Trait Anger ($p < .001$, Cohen's $d = .30$), Anger Expression ($p < .001$, Cohen's $d = .26$), and Anger In ($p < .001$, Cohen's $d = .23$) than CAN.

A final MANOVA was conducted to examine the interaction of ethnicity and illness status. This MANOVA indicated no significant interaction effect for any of the AESC subscales, Wilks' $\lambda = .998$, $F(8,1498) = .173$, $p > .90$.

Correlations among subscales of the AESC were consistent with the conceptual underpinnings of the instrument. Specifically, Trait Anger was positively associated with Anger Expression and negatively associated with Anger Control. Anger Expression was negatively associated with Anger Control, and Anger In was positively associated with Anger Control. Age was not significantly associated with Trait Anger, Anger Expression, or Anger In, but was weakly associated with Anger Control ($r = .13$, $p < .01$). See Table IV for complete correlation matrix of AESC subscales.

Cronbach's αs were calculated using the combined data set ($n = 803$). Results indicated acceptable internal consistency estimates for all four subscales: Trait Anger, $\alpha = .84$; Anger Expression, $\alpha = .69$, Anger In, $\alpha = .71$; and Anger Control, $\alpha = .79$. Alpha coefficients for the four subscales across illness groups are as follows: Trait Anger, $\alpha = .84/.82$ (healthy/cancer); Anger Expression, $\alpha = .68/.71$; Anger In, $\alpha = .74/.63$; and Anger Control, $\alpha = .74/.86$.

Table IV. Bivariate Correlations Among AESC Subscales for the Healthy Group (Below the Diagonal) and the Group with Cancer (above the diagonal)

	Trait anger	Anger expression	Anger in	Anger control
Trait anger	–	.60**	−.07	−.47**
Anger expression	.56**	–	−.03	−.36**
Anger in	.14*	−.12*	–	.38**
Anger control	−.34**	−.35**	.32**	–

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

Temporal Stability of the AESC

To examine the temporal stability (test–retest reliability) of the instrument, the AESC subscales were re-administered to a subset of the sample that included children on treatment for cancer ($n = 130$). Measures were administered three times: at the initial assessment shortly after diagnosis (time 1; T1), and at 6 (T2) and 12 months (T3) following the initial assessment. The Trait Anger subscale demonstrated the highest test–retest stability across both the 6- and 12-month intervals, which is consistent with expectations, although all subscales showed moderate and statistically significant consistency over time (Table V).

External Validation of the AESC

To examine the convergent validity of the instrument, correlations between the AESC subscales and the CMHS, the ChIA, the CHI (Total score, Aggression subscale, and Hostility subscale), and the BASC Aggression score were calculated using the data collected from Sample 2 (total $n = 310$, including 111 HC and 199 CAN). Pair-wise deletion of cases was necessary because of missing data across parent–child dyads. The number of children included in the correlational analyses for each measure ranged from 98 to 103 in the healthy group, and from 179 to 189 in the group of CAN.

As indicated by the matrix present in Table VI, the correlations between AESC subscales and other indices of self- and parent-reported children's anger, hostility, and aggression were consistent with the conceptual model of the AESC. Specifically, results indicated moderate and significant positive correlations between the Trait Anger and Anger Expression subscales of the AESC and both parent- and child-reported aggression, hostility, and anger within both healthy and cancer groups. Conversely, results indicated significant negative associations between Anger Control and most indices of anger, hostility, and aggression in the cancer sample, but not as consistently in the healthy sample. Anger In was generally not significantly correlated with parent or child measures of anger, hostility, and aggression.

Table V. Test–Retest Reliability Coefficients for the AESC Subscales across 6- and 12-Month Intervals in the Group of CAN from Sample 1 ($n = 130$)

AESC subscale	T1 to T2	T2 to T3	T1 to T3
Trait anger	.52**	.60**	.54**
Anger out	.44**	.45**	.31**
Anger in	.32**	.41**	.36**
Anger control	.37**	.56**	.40**

*$p < .01$; **$p < .001$.

Table VI. Correlations between AESC Subscales and Parent and Child Measures of Anger, Aggression, and Hostility in HC and CAN

	AESC Subscale							
	Trait anger		Anger expression		Anger in		Anger control	
	HC	*CAN*	*HC*	*CAN*	*HC*	*CAN*	*HC*	*CAN*
Parent report measures								
BASC	.14	.35**	.23*	.42**	−.06	−.08	−.01	−.31**
CHI Agg	.39**	.33**	.34**	.40**	−.03	−.16*	−.12	−.34**
CHI Host	.32**	.43**	.14	.33**	.24*	−.11	−.01	−.38**
CHI Total	.39**	.38**	.30**	.40**	.08	−.16*	−.06	−.38**
Child report measures								
CMHS	.61**	.37**	.50**	.33**	.12	.14	−.28*	−.34**
ChIA-total	.49**	.46**	.31**	.29**	.20*	-.00	−.20	−.25**

BASC, Behavioral Assessment System for Children–Parent Report Form (Aggression subscale); CHI Agg, Children's Hostility Inventory (Aggression Scale); CHI Host, Children's Hostility Inventory (Hostility Scale); CHI Total, Children's Hostility Inventory (Total Score); CMHS Total, Cook-Medley Hostility Scale (Total Score); ChIA Total, Children's Inventory of Anger (Total Score).
*$p < .05$; **$p < .01$.

Discussion

Given the association between anger expression and health outcomes reported in the literature for both adults (Bongard et al., 1998; Deffenbacher et al., 1996) and children (Kerr & Schneider, 2008), appropriate instrumentation for measurement of anger among both groups is necessary for the advancement of research on this topic. Existing anger expression scales for children have significant limitations that constrain their use in both research and clinical settings. The present study describes the evaluation and validation of a new anger expression scale for children that was developed in attempt to address some of these limitations.

As described earlier, the AESC was developed as a measure of both trait anger and multiple facets of anger expression and control. Modeled after the STAXI measure for adults (Spielberger, 1988), we developed the instrument to comprise four subscales reflecting trait anger, anger expression, anger in, and anger control. Results of the CFA indicate that the four-factor structure represents a good fit to the data and is superior to other plausible factor structures.

In terms of the instrument itself, our results suggest that the AESC offers a number of advantages to the assessment armamentarium in pediatric psychology. Of perhaps the greatest importance, nested tests of configural, loading, and strong invariance (Little, 1997) indicate that the factor structure of the AESC is invariant across HC and those with cancer. This represents a significant strength of the AESC, as it allows researchers and clinicians considerable assurance that facets of anger measured by the AESC in healthy and ill samples are, indeed, the same constructs. We are aware of no other measure of anger expression in children with evidence of similar factorial invariance. This aspect of the AESC makes it a particularly good choice for future studies investigating the causes, correlates, and consequences of pediatric anger expression in children with cancer. As noted by Kerr and Schneider (2008), the expression or internalization of anger ''may conceivably exacerbate either the physical [illness], or more probably, its psychological concomitants'' (p. 16).

Second, measures of internal consistency of the AESC subscales indicate moderate improvements over some factors that have been identified in existing measures of anger expression in children (Hagglund et al., 1994). We are particularly encouraged by the relatively high estimates of internal consistency on the Anger Control subscale, as this construct has been shown to predict clinical status in children and adults (e.g., depression; Kashani et al., 1995; cytoimmunological variables; Penedo et al., 2006). Consistent with the predictions of Hagglund and colleagues in their investigation of the PAES-III, we attribute some of the improvement in the Anger Control subscale to the addition of developmentally appropriate items to the measurement of the construct.

Third, our short- (i.e., 6 month) and long-term stability (12 month) estimates were moderate (r's = .32–.60), and were consistent with the conceptual underpinnings of the instrument: Trait anger demonstrated generally higher stability than the other anger expression subscales (Anger Expression, Anger In, and Anger Control) across 6- and 12-month intervals. However, a clear state-trait distinction was not observed. Although anger-expression, anger-in, and anger-control may be more state-like and influenced by temporal environmental change, there is also evidence of consistency over time, which suggests an enduring or trait-like aspect to these constructs. Few estimates of

temporal stability of measures of anger expression among children are available in the literature. Our estimates of test–retest stability exceed the one example that we were able to locate in a child sample (del Barrio et al., 2004). We are not able to comment on whether the stability of the instrument was affected by the children's diagnosis and treatment for cancer. We are also not able to comment on the degree to which children's cognitive or social development over the 12 months contributed to the estimates of stability. Further research on the stability of the measure is needed both in terms of normal development and in terms of differences across diagnostic groups.

Our results were also encouraging with regard to the external validity of the AESC. Results indicated robust correlations between AESC subscales (particularly the Trait Anger and Anger Expression subscales) and other indices of child- and parent-reported child anger expression in both HC and those with cancer. Interestingly, Anger In was not consistently associated with the ChIA or the CHI, perhaps suggesting that children and parents view internalized anger and anger control as relatively independent of some outward manifestations of anger. Further, correlations between Anger Control and the CHI (parent report) subscales were significant only in the sample with cancer and not in the healthy sample. These differences may suggest that the CAN in our sample were more successfully controlling their anger than the HC. However, these discrepant results could be the result of dynamics within families affected by pediatric cancer: previous research has indicated greater consistency between parent and child report measures among families of CAN (as compared to HC; Russell, Hudson, Long, & Phipps, 2006). Further work in the validation of the Anger In and Anger Control subscales is clearly indicated.

The findings regarding the factorial invariance allowed the unique opportunity for preliminary examination of differences in the expression of anger across healthy and pediatric samples. In other samples (Hagglund et al., 1994) mean levels of anger expression have not differed significantly across diagnostic groups. However, the findings of higher Trait Anger, Anger Expression, and Anger In in the healthy sample relative to the sample of CAN are generally consistent with reports of muted expression of unpleasant emotions in children with illness relative to HC (Canning, Canning, and Boyce, 1992; Phipps & Srivastava, 1997; Phipps & Steele, 2002; Steele, Phipps, & Srivastava, 1999). Examination of the outcomes associated with expression of various facets of anger in healthy and ill samples of children remains an important area for research.

Consistent with other reports of anger expression (Hagglund et al., 1994; Jacobs & Kribaizl, 1991, as cited by Hagglund et al., 1994), mean levels of AESC subscales did not vary by gender of respondent. However, mean differences on Anger Expression and Anger Control did emerge across ethnic groups, with African-American participants reporting higher Anger Control scores and Lower Anger Expression scores than European-American participants. Using a subsample of the present samples, Steele, Elliott, and Phipps (2003) reported that African-American children (generally) and African-American children with chronic illnesses (specifically) evidenced a higher prevalence of a repressive adaptive style (Weinberger, Schwartz, & Davidson, 1979) than European Americans and those children without illnesses. Although we found no evidence of *ethnicity* × *illness* group interactions in the current sample, the main effects that we found are generally consistent with the earlier report of Steele and colleagues (2003), indicating greater inhibition of unpleasant emotional states (i.e., lower anger expression and greater anger control) among both chronically ill and African-American children.

The present findings must be viewed within the constraints of the study limitations. First, the data did not allow for an examination of clinical outcomes associated with anger expression or control. The degree to which high scores on the AESC are associated with functional impairment (i.e., clinical significance) is not clear. Future cross-sectional and longitudinal studies examining physical and psychosocial functioning in light of anger expression and anger control are needed for the clinical validation of the instrument. Second, the data do not allow for the creation of standardized scores for the AESC. Although the large and relatively diverse sample provides a basis for comparison across studies, a more geographically and ethnically representative sample is needed for a true normative group.

Additional work is needed to determine the degree to which factorial invariance of the AESC extends to other illness groups and across ethnic or cultural groups. As noted earlier, mean levels of anger expression differed by ethnicity; however, these differences are difficult to interpret without first establishing measurement invariance across ethnic groups. Unfortunately, our sample did not include large enough numbers of African-American children to allow nested tests of invariance across ethnicity. In addition, our methods included different modes of instrument presentation across illness groups (individual vs. group format). The degree to which this variance affected scores is not known and

should be investigated in future studies. Finally, the relatively low response rate (i.e., 37%) for the acquaintance control sample represents a possible limitation to the generalization of findings.

These limitations notwithstanding, our results indicate that the AESC is a potentially useful measure of trait anger and anger expression in children. The AESC has a robust and theoretically grounded factor structure that is consistent across ethnically diverse healthy and ill samples of children. Estimates of internal consistency are acceptable, and correlational analyses indicate that the various subscales of the measure demonstrate very good convergent validity with other measures of anger and hostility. Further research on the development of anger expression in childhood and the associations between anger expression and physical and psychological outcomes and correlates are needed, and the AESC appears to be a promising instrument to facilitate such studies.

Appendix

Appendix. The Anger Expression Scale for Children

Below are a number of statements which children and adults sometimes use to describe themselves. Read each statement and circle the number that describes you best, or shows how you **usually** feel.

		Almost Never	Sometimes	Often	Almost Always
1.	I feel angry	1	2	3	4
2.	I feel like yelling at someone	1	2	3	4
3.	I'm easygoing and don't let things bother me*	1	2	3	4
4.	I get very impatient if I have to wait for something	1	2	3	4
5.	I lose my temper easily	1	2	3	4
6.	I feel like breaking things	1	2	3	4
7.	I feel grouchy or irritable	1	2	3	4
8.	I get in a bad mood when things don't go my way	1	2	3	4
9.	I takes a lot to get me upset*	1	2	3	4
10.	I have a bad temper	1	2	3	4
11.	I get very angry if my parent or teacher criticizes me	1	2	3	4
12.	I get in a bad mood easily	1	2	3	4

Everyone feels angry from time to time, but people differ in how they act when they are angry. Below are some statements that people use to describe themselves and how they act **when they feel angry**. Read each statement carefully, and decide how often the statement applies to you **when you feel angry**: 1 = Almost Never; 2 = Sometimes; 3 = Often; 4 = Almost Always

		Almost Never	Sometimes	Often	Almost Always
13.	I slam doors or stomp my feet	1	2	3	4
14.	I keep it to myself	1	2	3	4
15.	I control my temper	1	2	3	4
16.	I let everybody know it	1	2	3	4
17.	I pout or sulk*	1	2	3	4
18.	I try to be patient	1	2	3	4
19.	I argue or fight back	1	2	3	4
20.	I don't talk to anybody*	1	2	3	4
21.	I keep my cool	1	2	3	4
22.	I hit things or people	1	2	3	4
23.	I feel it inside, but I don't show it	1	2	3	4
24.	I stay well behaved	1	2	3	4
25.	I say mean or nasty things	1	2	3	4
26.	I stay mad at people but keep it secret	1	2	3	4
27.	I try to stay calm and settle the problem	1	2	3	4
28.	I have a temper tantrum	1	2	3	4
29.	I hold my anger in	1	2	3	4
30.	I try to control my angry feelings	1	2	3	4

*Item not included in CFA due to low item-total correlation.

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References

Bongard, S., al' Absi, M., & Lovallo, W. R. (1998). Interactive effects of trait hostility and anger expression on cardiovascular reactivity in young men. *International Journal of Psychophysiology, 28*, 181–191.

Broman, C. L., & Jackson, E. H. (1988). Anger expression and life stress among Blacks: Their role in physical health. *Journal of the National Medical Association, 80*, 1329–1334.

Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. New York: Guildford.

Canning, E. H., Canning, R. D., & Boyce, W. T. (1992). Depressive symptoms and adaptive style in children with cancer. *Journal of the American Academy of Child and Adolescent Psychiatry, 31*, 1120–1124.

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*, 233–255.

Cook, W. W., & Medley, D. M. (1954). Proposed hostility and pharisaic virtue scales for the MMPI. *Journal of Applied Psychology, 38*, 414–418.

Deffenbacher, J. L., Oetting, E. R., Lynch, R. S., & Morris, C. D. (1996). The expression of anger and its consequences. *Behavioral Research and Therapy, 34*, 575–590.

del Barrio, V., Aluja, A., & Spielberger, C. (2004). Anger assessment with the STAXI-CA: Psychometric properties of a new instrument for children and adolescents. *Personality and Individual Differences, 37*, 227–244.

Flanagan, R., & Allen, K. (2005). A review of the Children's Inventory of Anger (CHIA): A needed measure. *Journal of Rational-Emotive & Cognitive-Behavior Therapy, 23*, 263–273.

Forgays, D. G., Forgays, D. K., & Spielberger, C. D. (1997). Factor structure of the state-trait anger expression inventory. *Journal of Personality Assessment, 69*, 497–507.

Hagglund, K. J., Clay, D. L., Frank, R. G., Beck, N. C., Kashani, J. H., Hewett, J., et al. (1994). Assessing anger expression in children and adolescents. *Journal of Pediatric Psychology, 19*, 291–304.

Hauber, R. P., Rice, M. H., Howell, C. C., & Carmon, M. (1998). Anger and blood pressure readings in children. *Applied Nursing Research, 11*, 2–11.

Jacobs, G. A., & Kronaizl, C. (1991). *Pediatric anger in rural impoverished communities*. Paper presented at the annual meeting of the American Psychological Association. San Francisco, CA.

Jacobs, G. A., Phelps, M., & Rohrs, B. (1989). Assessment of anger expression in children: The pediatric anger expression scale. *Personality and Individual Differences, 10*, 59–65.

Jöreskog, K., & Sörbom, D. (2005) LISREL 8.72. [Computer Software]. Lincolnwood, IL: Scientific Software International, Inc.

Kashani, J. H., Dahlmeier, J. M., Borduin, C. M., Soltys, S., & Reid, J. C. (1995). Characteristics of anger expression in depressed children. *Journal of American Academy of Child and Adolescent Psychiatry, 34*, 322–326.

Kazdin, A. E., Rodgers, A., Colbus, D., & Siegel, T. (1987). Children's hostility inventory: Measurement of aggression and hostility in psychiatric inpatient children. *Journal of Clinical Child Psychology, 16*, 320–328.

Kerr, M. A., & Schneider, B. H. (2008). Anger expression in children and adolescents: A review of the empirical literature. *Clinical Psychology Review*, *28*, 559–577.

Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed.). New York: Guildford.

Liehr, P., Meininger, J. C., Mueller, W. H., Chan, W., Frazier, L., & Reyes, L. R. (2000). Psychometric testing of the adolescent version of the Cook-Medley hostility scale. *Issues in Comprehensive Pediatric Nursing, 23*, 103–116.

Little, T. D. (1997). Mean and covariance structures (MACS) analyses of cross-cultural data: Practical and theoretical issues. *Multivariate Behavioral Research, 32*, 53–76.

Little, T. D., & Slegers, D. W. (2005). Factor analysis: Multiple groups with means. In B. Everitt, & D. Howell (Eds.), & D. Rindskopf (Section Ed.), *Encycolpedia of statistics in behavioral science* (Vol. 2, pp. 617–623). Chichester, UK: Wiley.

Nelson, W. M., & Finch, A. J. (2000). *Children's Inventory of Anger*. Los Angeles, CA: Western Psychological Services.

Penedo, F. J., Dahn, J. R., Kinsinger, D., Antoni, M. H., Molton, I., Gonzalez, J. S., et al. (2006). Anger suppression mediates the relationship between optimism and natural killer cell cytotoxicity in men treated for localized prostate cancer. *Journal of Psychosomatic Medicine, 60*, 423–427.

Phipps, S., & Srivastava, D.K. (1997). Repressive adaptation in children with cancer. *Health Psychology, 16*, 521–528.

Phipps, S., & Steele, R. G. (2002). Repressive adaptive style in children with chronic illness. *Psychosomatic Medicine, 64*, 34–42.

Reynolds, C. R., & Kamphaus, R. W. (1992). *Behavior assessment system for children: Manual*. Circle Pines, MN: American Guidance Services, Inc.

Russell, K. M. W., Hudson, M., Long, A., & Phipps, S. (2006). Assessment of health related quality of life in children with cancer: Consistence and agreement between parent and child reports. *Cancer, 106*, 2267–2274.

Sandoval, J., & Echandia, A. (1994). Behavior assessment system for children. *Journal of School Psychology, 32*, 419–425.

Spielberger, C. D. (1988). *State-Trait Anger Expression Inventory*. Orlando, FL: Psychological Assessment Resources.

Steele, R. G., Elliott, V. E., & Phipps, S. (2003). Race and health status as determinants of anger expression and adaptive style in children. *Journal of Social and Clinical Psychology, 22*, 40–57.

Steele, R. G., Phipps, S., & Srivastava, D. K. (1999). Low-end specificity of childhood measures of emotional distress: Consistent effect for anxiety and depressive symptoms in a non-clinical population. *Journal of Personality Assessment, 73*, 276–289.

Steiger, J. H., Shapiro, A., & Browne, M. W. (1985). On the multivariate asymptotic distribution of sequential chi-square statistics. *Psychometrika, 50*, 253–264.

Weinberger, D. A., Schwartz, G. E., & Davidson, R. J. (1979). Low-anxious, high-anxious, and repressive coping styles: Psychometric patterns and behavioral and physiological responses to stress. *Journal of Abnormal Psychology, 88*, 369–380.

Woodall, K. L., & Matthews, K. A. (1993). Changes in and stability of hostile characteristics: Results from a 4-year longitudinal study of children. *Journal of Personality and Social Psychology, 64*, 491–499.