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Higher- and Lower-Order Factor Analyses of the Children's Behavior Questionnaire in Early and Middle Childhood

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Abstract

The Children's Behavior Questionnaire (CBQ; Rothbart, Ahadi, & Hershey, 1994), a 195-item parent-report questionnaire, is one of the most widely used measures of child temperament, with previous analyses of its scales suggesting that three broad factors account for the overarching structure of child temperament (Rothbart, Ahadi, Hersey, & Fisher, 2001). However, there are no published item-level factor analyses of the CBQ, meaning that it is currently unclear whether items clearly load onto CBQ scales as proposed by its developers. Additionally, although the CBQ is intended to cover a broad window of development (i.e., ages 3–7), little is known about whether the structure of the CBQ differs depending on child age. The present study used a bottom-up approach to examine the lower- and higher-order structure of the CBQ in a large community sample of children at ages 3 (*N*=944) and 5/6 (*N*=853). Item-level exploratory factor analyses (EFAs) identified 88 items at age 3 and 87 items at age 5/6 suitable (i.e., with loadings ≥.40) for constructing lower-order factors. Of the lower-order factors derived at ages 3 and 5/6, fewer than half resembled original CBQ scales (Rothbart et al., 1994; 2001). Higher-order EFAs of the lower-order factors suggested that a four-factor structure was the best fit at both ages 3 and 5/6. Thus, results indicate that a substantial number of CBQ items do not load well on a lower-order factor and that more than three factors are needed to account for its higher-order structure.

Despite the longstanding interest in temperament (Hergenhahn & Henley, 2009) and its associations with important outcomes (Digman, 1994; Clark & Watson, 2008), fundamental questions regarding its structure, developmental progression, and methods of assessment are still debated (De Pauw & Mervielde, 2010; Durbin & Wilson, 2012; Dyson, Olino, Durbin,

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Goldsmith, & Klein, 2012). Much contemporary research has been informed by a model developed by Rothbart (2007) that conceptualizes child temperament in terms of individual differences in emotional reactivity and self-regulation (i.e., the ability to modulate reactive processes). This model is instantiated in the Children's Behavior Questionnaire (CBQ; Rothbart, Ahadi, Hershey, & Fisher, 2001), a caregiver-report measure developed for assessing temperament in children 3 to 7 years of age. Over the past decade, the CBQ has become one of the most widely used measures of child temperament in the field; for example, Rothbart and colleagues' paper (2001) describing the CBQ's development and validation has been cited over 900 times.

The CBQ was developed using a rational approach to items and scales (Capaldi & Rothbart, 1992; Derryberry & Rothbart, 1988; Rothbart et al., 2001). More specifically, the CBQ items were taken from existing temperament questionnaires covering other developmental stages, including the Infant Behavior Questionnaire (Rothbart, 1981) and the Physiological Reactions Questionnaire (a measure of adult temperament; Derryberry & Rothbart, 1988). Items from these measures were revised to be developmentally appropriate for preschoolers. Next, parents (12 mothers and 3 fathers) were asked to provide feedback on the items' face validity. The authors used these items to form 15 *a priori* temperament trait scales based on those used in the New York Longitudinal Study (Thomas & Chess, 1977). The measure was then administered to the parents of 262 3–7-year-old children and reduced to 195 items by eliminating items that did not show item-total correlations of at least .20 with the scale on which they were posited to load (Rothbart et al., 1994). The structure of the trait scales was examined via principal axis factor analysis, which indicated that three superordinate factors (Surgency, Negative Affectivity or NA, and Effortful Control or EC) accounted for much of the variance tapped by the CBQ (Rothbart et al., 2001). The higher-order Surgency factor consisted of the following scales: Activity Level, High Intensity Pleasure, Impulsivity, and Shyness (reversed). The NA factor consisted of Anger/Frustration, Discomfort, Fear, Sadness, and Soothability/Falling Reactivity (reversed). The EC factor consisted of Attentional Focusing, Inhibitory Control, Low Intensity Pleasure, and Perceptual Sensitivity. The CBQ also includes scales measuring Approach/Positive Anticipation and Smiling/Laughter; however, Smiling/Laughter showed high loadings on both Surgency and EC and Approach/Positive Anticipation loaded on all three factors (Rothbart et al., 2001). As a result, no primary factors were identified for these two scales. Similarly, the Attentional Shifting scale was not assigned to a specific factor due its inconsistent pattern of loadings (Rothbart et al., 1994; 2001).

The CBQ was subsequently administered in several U.S. samples comprised of 149 3-year-olds, 516 4–5-year-olds, and 341 6–7-year-olds, with a similar structure at the higher-order level emerging in each sample (Rothbart et al., 2001). Further, the higher-order three-factor structure reported by Rothbart and colleagues (2001) was evident in other samples (Ahadi, Rothbart, & Ye, 1993; Kochanska, De Vet, Goldman, Murray, & Putnam, 1994; Richard, Davis, & Burns, 2008). However, to our knowledge, no study has examined the structure of the full CBQ at the item level. Thus, whether the CBQ items cluster together to form the 15 lower-order scales they are postulated to form is unclear. It is also important to note that the full version of the CBQ (Rothbart et al., 2001) is quite lengthy (195 items). While short

versions of the CBQ have been developed, these versions were not created based on item-level factor analyses. For example, Putnam and Rothbart (2006) developed short (94 items; 15 scales) and very short (35 items; three broad factors) versions of the CBQ using item-total correlations and within-scale factor analytic procedures for scale item selection. The very short version contains three scales reflecting Surgency, NA, and EC represented by two or three items for each scale (Putnam & Rothbart, 2006). However, Rothbart et al's use of item-total correlations to derive factors yields factors that are strongly affected by item properties. As a result, these factor structures may be less accurate and difficult to replicate (Goodwin & Leech, 2006). Indeed, evidence for the validity of these shorter versions has been mixed; for example, the three-factor item-level structure of the very short form of the CBQ showed only a marginal fit to the data (Putnam & Rothbart, 2006). An item-level analysis of the full version would be a more stringent and empirical means of shortening the CBQ by identifying items that could be dropped without undue loss of information.

There are other gaps in the literature on the CBQ. In particular, there are very few studies testing whether a similar higher-order structure is found in different ages of children. This is noteworthy given that the CBQ was designed to assess child temperament across a fairly broad window of development during early and middle childhood, a period in which rapid developmental changes are known to occur (Blankson et al., 2013; Creel, 2012; Welch-Ross, 1995). At the higher-order level, Rothbart et al. (2001) argued that the CBQ's structure did not change from age 3 to age 7 based on an examination of the similarities of factor patterns in separate samples of younger (3-year-olds) and older (6–7-year-olds) children, concluding that the CBQ higher-order structure was comparable across time. However, a more stringent approach would be to use item-level exploratory factor analysis (EFA) followed by a scale-level EFA in samples of children that span the age range covered by the CBQ. While research on the structure of child temperament is generally sparse, especially in comparison to the analogous literature on adult temperament/personality (McCrae & Costa, 2008; Zuckerman, 2011), extant studies suggest that there may be differences in the number and nature of broad dimensions of temperament across this period of development (Dyson et al., 2012; Kotelnikova, Olino, Mackrell, Jordan, & Hayden, 2013). Thus, investigating whether the CBQ evinces the same structure in samples of children that vary in age is another important step in research on this instrument.

To summarize, an item-level EFA of the CBQ would provide empirically grounded information on the nature of its lower-order scales, as well as identifying any poorly functioning items, and a developmentally informative design would speak to the nature of the CBQ's structure over time. Furthermore, the EFA approach at the higher-order level replicates methods used by Rothbart et al. (2001). We therefore investigated the higher- and lower-order structure of the CBQ in a large community sample of primary caregivers and their children assessed at age 3 (N=944) and followed up 3 years later (N=853). Conducting parallel analyses at both waves of data (i.e., child ages 3 and 5/6), we first performed an EFA of the CBQ items at the item level, dropping poorly functioning items (i.e., those with loadings < .40). We then performed a higher-order EFA on the factors obtained from the item-level analyses to examine the broader temperament structure of the CBQ, and whether it was consistent with the three-factor solution obtained by Rothbart et al. (2001).

Method

Participants

Data from this study were collected at two different sites: XXXX, ON, Canada (hereafter referred to as the ON sample) and XXXX, New York, USA (referred to as the NY sample). The data sets described in this project were a part of larger longitudinal studies conducted at each of these sites. At the two waves of data collection, 944 3-year-olds and 853 5/6-year-olds and their mothers participated (see Table 1 for sample descriptive statistics). The two samples were generally similar on participant demographics, suggesting that combining the two datasets for analyses was reasonable; we also compared mean CBQ scale scores for the two samples (see next section). To further verify the appropriateness of combining the two samples, we conducted specific tests of structural invariance, as described later in the paper.

Assessment of Temperament

Primary caregivers completed the CBQ as a measure of their child's temperament at ages 3 and ages 5/6 at both sites. The standard form of the CBQ consists of 195 items rated on a 7-point Likert scale ranging from 1 (extremely untrue) to 7 (extremely true). Scale means and internal consistency statistics are presented in Table 2, and are comparable to those reported in the extant literature (Carranza, Gonzales-Salinas, & Ato, 2013; Komsi et al., 2008; Putnam & Rothbart, 2006; Rothbart et al., 2001).

Between-sample differences

Independent-sample t-tests were conducted to examine mean-level differences in scale scores between the two samples. Ten CBQ scales differed significantly ($p < .05$) between the samples. The pattern of results showed that primary caregivers in the NY sample tended to rate their children at age 3 as consistently higher on traits than primary caregivers in the ON sample. At age 5/6, there were four significant mean differences between the two samples (see Table 2); primary caregivers in the NY sample continued to rate their children as higher on temperament traits than primary caregivers in the ON sample, with the exception of Shyness for which the pattern was reversed. In general, effect sizes for between-sample mean differences on the CBQ scales were quite small except for Fear (d=.43) and Perceptual Sensitivity (d =.38), both at age 3. Further, mean differences on scale scores do not influence structural analyses (Goodwin & Leech, 2006). Scale distributions were generally good; the mean skewness value for the ON age 3 sample was −.28 (range −.99–.30) and the mean kurtosis value was .18 (range −.18 −1.95). The mean skewness value for the NY age 3 sample was −.29 (range −.29 – .29) and the mean kurtosis value was .12 (range .26 – 1.10). The mean skewness value for the ON age 5/6 sample was −.23 (range −.20 – .22) and the mean kurtosis value was .02 (range .14–.68). The mean skewness for the NY age 5/6 sample was −.20 (range .15–.35) and the mean kurtosis value was −.02 (range −.36–.79).

Statistical Approach

As a first step, items[1] were subjected to EFAs[2] using Mplus 7 statistical software (Muthen & Muthen, 1998–2012). For parameter estimation procedures, we used the maximum

likelihood robust (MLR) estimator (Muthen & Muthen, 1998-2012) and the geomin oblique rotation method recommended by Browne (2001). This rotation was used for both higher- and lower-order factor analyses. The Kaiser-Guttman criterion for factor retention in an EFA indicates that factors with eigenvalues over 1 should be retained. Aside from following this criterion for evaluation of our EFA solutions, we also performed a parallel analysis (O'Connor, 2000) in which we ran a gross simulation with 1000 replications to determine what the eigenvalues would be if there were the same number of cases and variables, but the data were random. If the eigenvalues from our real data were lower than expected due to chance (i.e., those produced from the parallel analysis), then that factor would not be interpreted as capturing any latent traits present in the data.

The obtained lower-order factors were then computed as averages of their corresponding items with loadings of ≥ .40[3]. In case of cross-loadings (three at age 3 and four at age 5/6), we assigned items to factors with higher (primary) loadings. Next, to examine the higher-order structure of the CBQ, the obtained lower-order factors were subjected to a series of EFAs extracting three to five factors[4]. The decision to focus on three to five factor models was based on the extant literature on personality and temperament structure (Caspi & Shiner, 2006; De Pauw & Mervielde, 2010; McCrae & Costa, 2008; Rothbart et al., 2001; Simonds & Rothbart, 2004; Watson & Clark, 1993), which suggests that most of the variance in both child and adult temperament/personality is accounted for by three to five broad factors (Markon, Kruger, & Watson, 2005). We used comparative fit index (CFI) values of above .90 and .95 as indices of acceptable and excellent fit (Hu & Bentler, 1999). Additionally, we treated root-mean-square of approximation (RMSEA) values that were lower than .05 as indicating a close fit, with values up to 0.08 indicating acceptable fit (Marsh, Hau, & Wen, 2004). Models with varying numbers of factors were compared using the Satorra-Bentler chi-square difference test (Asparouhov & Muthen, 2013). Due to our large sample size, we could adopt a more stringent test of $p < .01$ for comparisons between models for deciding between different models.

As a final step, we followed a step-wise procedure outlined by Little (2013) to ascertain structural invariance of the higher order solution across the two samples. Thus, models approximating three-, four-, and five-factor solutions obtained at both time points were fitted in a confirmatory factor analysis framework. We subsequently tested for weak, strong, and strict invariance across the two samples (ON and NY). Tests of weak factorial invariance

[1]Item 104 "Tends to say the first thing that comes to mind, without stopping to think about it" was accidently omitted from the questionnaire booklets used during the assessment in NY sample when children were 3 years old.

[2]We also used item-level confirmatory factor analyses (CFAs) in an attempt to validate the original scales created by Rothbart and colleagues (2001). The fit for these lower-order models in both the 3-year-old and 5/6-year-old samples was poor based on the CFI ($CFI_{3\ y.o.\ sample}$ =.58 and $CFI_{5/6\ y.o.\ sample}$ =.31), although RMSEA values were acceptable for both age groups ($RMSEA_{3y.o.\ sample}$ = .04 and $RMSEA_{5/6y.o.\ sample}$ = .05). There were also model estimation issues associated with the latent variable covariance matrix (PSI), which was not positive definite in the 5/6-year-olds. Further details of these analyses are available upon request. These results are presented in the Supplemental tables A and B.

[3]Although a cut-off of .30 is sometimes used to designate an acceptable loading in EFAs, use of a more stringent cut-off of .40 is also common (Briggs & MacCallum, 2003; Comrey, 1973; Hogarty, Kromrey, Ferron, & Hines, 2004). In the current study, the cut-off of . 30 produced a greater number of items with high cross-loadings (see Tables 3 and 4), resulting in more poorly differentiated lower-order factors.

[4]We also used CFAs at the higher-order level in an attempt to validate the original three-factor structure of the original lower-order scales proposed by Rothbart and colleagues (2001). The fit of such models was poor based on all fit statistics in both 3- and 5/6-year olds ($RMSEA_{3y.o.\ sample}$ = 14; $CFI_{3\ y.o.\ sample}$ = .70; $RMSEA_{5/6y.o.\ sample}$ = 15; $CFI_{5/6\ y.o.\ sample}$ = .69). Further details of these analyses are presented in the Supplemental Table C.

involve setting each corresponding loading in the two samples to be equal; however, variances, intercepts, and residuals are allowed to vary. Testing strong invariance involves imposing equality constraints on each observed intercept across samples, and tests of strict invariance impose equality constraints on residuals across samples (Little, 2013). Higher levels of factorial invariance are acceptable if the change in model fit from a lower level of invariance to a higher level of invariance is negligible, i.e., if the change in RMSEA and CFI does not exceed .015 (Chen, 2007).

Results

Item-Level Exploratory Factor Analysis at Age 3

Results of an item-level EFA of the age 3 data in the combined sample are shown in Table 3. Initially, this analysis identified 54 factors with eigenvalues over 1; however, only 17 factors with larger eigenvalues than the simulated data sets were extracted based on the results of the parallel analysis (O'Connor, 2000). Model fit of the 17-factor EFA solution was deemed good based on the RMSEA (.02); however, the CFI (.85) was weak. Of the 195 items analyzed, 107 items had primary loadings < .40, and were excluded from subsequent analyses. Items that were excluded from further analyses largely came from the following original CBQ scales: Low Intensity Pleasure (11 items), Sadness (10 items), Inhibitory Control (10 items), Impulsivity (nine items), Approach/Positive Anticipation (nine items), Discomfort (eight items), Perceptual Sensitivity (eight items), Fear (eight items), and Soothability/Falling Reactivity (five items). Most of the original scales included by Rothbart and colleagues (1994; 2001) consist of 12 to 13 items; thus, it is noteworthy that excluding more than half of the items from these scales suggests that these constructs will not be adequately represented by the resulting measure. Finally, 88 items had primary loadings ≥ .40. Of the 17 factors extracted, two factors were excluded from further analyses as they consisted of a single item ("Likes sounds of words and nursery rhymes" and "Goes after what he/she wants"). Thus, 15 factors remained for subsequent analyses (Table 3; see also Supplemental Table D for a list of the items excluded from further analyses).

Of these 15 lower-order factors, seven had content that resembled an original CBQ scale[5] (Rothbart et al., 1994; 2001). These included factors containing items measuring (Low) Shyness (16 items; α = .94), Smiling/Laughter (eight items; α = .77), (Low) Attentional Focusing (seven items; α=.75), Soothability/Falling Reactivity (six items; α = .77), High Intensity Pleasure (five items; α =.77), (Low) Activity Level (five items; α = .73), and Approach/Positive Anticipation (four items; α=.65). Three additional factors contained a mix of items from at least two original CBQ scales; more specifically, our EFA resulted in factors capturing Impulsivity/High Intensity Pleasure (seven items; α = .76), Anger/Sadness (five items; α = .76), and Inhibitory Control/Attentional Shifting (five items; α=.72). Finally, five factors did not tap constructs that mapped clearly onto contemporary developmental theories of child temperament based on the CBQ or other models. One tapped low distress due to physical pain and bruises (four items; α=.80), anger about going

[5]We retained the original CBQ scale names for these lower-order factors in order to facilitate comparisons with the scales developed by Rothbart et al. (1994; 2001).

to bed (three items; α = .75), fear of darkness (two items; α = .79), fear of loud noises (two items; α =.20), and noticing changes in clothing and appearances (2 items; α = .83).

Item-Level Exploratory Factor Analysis at Age 5/6

The same data reduction approach was used for the combined sample assessed at age 5/6 (see Table 4). A 17-factor extraction yielded a good fit based on the RMSEA (.03); however, the CFI (.85) was below the minimum recommended value of .90. Of the 195 items analyzed, 108 items had loadings that were <.40; a large majority of these items (82%; *n*=88) had similarly low loadings in the age 3 EFA. Similar to the results obtained at age 3, many items were excluded from Low Intensity Pleasure (12 items), Sadness (10 items), Inhibitory Control (nine items), Approach/Positive Anticipation (eight items), Perceptual Sensitivity (eight items), Fear (eight items), Soothability/Falling Reactivity (eight items), Discomfort (seven items), and Impulsivity (seven items). 87 items had loadings ≥.40; the majority of these (*n* = 68; 78%) also had loadings ≥.40 in the EFA of the age 3 data. Two of the 17 lower-order factors extracted did not have any item loadings ≥ .40 and were therefore excluded from further analyses (see Supplemental Table E for a list of all items excluded from further analyses).

The 15 remaining factors are presented in Table 4. Of these factors, four resembled original CBQ scales; these included factors with items tapping Smiling/Laughter (eight items; α=. 78), Anger/Frustration (six items; α=.80), Soothability/Falling Reactivity (four items; α=. 72), and Approach/Positive Anticipation (four items; α=.64). The original High Intensity Pleasure scale split into two factors consisting of items tapping quiet play (four items; α=. 74) and adventurousness (four items; α=.77). Three factors consisted of a mix of items from several original CBQ scales, including a Sociability factor consisting of Shyness, Impulsivity, Smiling/Laughter, and High Intensity Pleasure items (18 items; α=.88), a (low) EC factor comprised of Attentional Focusing, Inhibitory Control, Impulsivity, and Activity Level items (16 items; α=.88), and a (low) Activity Level factor consisting of Activity Level, Attentional Focusing, and Low Intensity Pleasure items (six items; α=.77). Finally, six factors did not resemble traditional temperament constructs. These included one containing items reflecting being irritated by mistakes (two items; α = .50), a factor comprised of items tapping fear of darkness (two items; α=.81), fear of loud noises (two items; α=.25), low distress by physical pain or bruises (five items; α=.79), not feeling upset by sad stories (two items; α=.68), and the tendency to notice changes in clothing and appearances (four items; α=.82).

Considering the age 3 and age 5/6 results as a whole, many of the items (*n* = 68, 78%) with acceptable loadings at age 3 also had acceptable loadings at age 5/6. Additionally, the same number of lower-order factors (15) was retained at both ages. Although this number is comparable to the 17 scales proposed by Rothbart et al. (2001), only seven [Smiling/ Laughter, (Low) Shyness, (Low) Attentional Focusing, Soothability/Falling Reactivity, High Intensity Pleasure, (Low) Activity Level, and Approach/Positive Anticipation] resembled an original CBQ scale in the age 3 analyses, and only four (Smiling/Laughter, Anger/ Frustration, Soothability/Falling Reactivity, and Approach/Positive Anticipation) at age 5/6. Overall, conceptually similar versions of only three original CBQ scales (Smiling/Laughter,

Soothability/Falling Reactivity, and Approach/Positive Anticipation) were found at both time points in our sample. The remaining lower-order factors extracted at both ages consisted of a mix of items from different original CBQ scales or represented constructs that are not found in contemporary theories of temperament. More specifically, of the lower-order factors consisting of a mix of items from different original scales, only one emerged consistently at both ages. Of the remaining lower-order factors, four tapping constructs not central to temperament (i.e., fear of darkness, fear of loud noises, low distress by physical pain or bruises, and tendency to notice changes in clothing and appearances) were found at both ages.

Higher-Order Exploratory Factor Analysis at Age 3

The 15 factors identified using the item-level EFA were subjected to a higher-order EFA with a geomin rotation and using MLR estimator. Three to five factors were extracted from the 15 lower-order factors identified at age 3 (Table 3 and Supplemental Table F). A three-factor model yielded a marginally acceptable fit (RMSEA = .06; CFI = .91). The first factor of this model appeared to tap different facets of EC; the second combined lower-order factors of Anger/Sadness, Soothability/Falling Reactivity, and Inhibitory Control/Attentional Shifting, and the third was consistent with the construct of extraversion/surgency (see Table F of the Online Supplement). Of note, although fit was marginal, this three-factor structure and content resembles the three-factor model original proposed by Rothbart et al. (2001).

A four-factor model (presented in Table 5) yielded a significantly better fit based on the chi-square and CFI difference tests ($\Delta\chi^2$ (12) = 89.87; p<.001; RMSEA = .05; CFI = .95; ΔCFI = .05). The first factor of this model appeared to be consistent with the construct of sensation-seeking, as it was comprised of High Intensity Pleasure and Impulsivity. The second factor, comprised largely of Attentional Focusing, Inhibitory Control/Attentional Shifting, Activity Level, and Anger/Sadness tapped low EC/disinhibition and some aspects of NA. The third factor primarily reflected low NA, consisting of (Low) Shyness, low Anger/Sadness, and Soothability, while the fourth represented mostly a combination of Smiling/Laughter and Approach/Positive Anticipation (Table 5).

A five-factor model presented in Table 5 yielded a significantly better fit than the four-factor model based on the chi-square difference and the CFI difference tests ($\Delta\chi^2$ (11) =44.19; p<.001; RMSEA =.05; CFI =.97; ΔCFI =.02). Similar to the four-factor model, the first factor of this model resembled mostly sensation-seeking and the second factor appeared to tap low EC/disinhibition. The third factor appeared to tap NA and aspects of EC, largely consisting of Anger/Sadness and Impulsivity. The fourth factor comprised of soothability and emotion regulation, and the fifth was mostly a combination of Smiling/Laughter and Approach/Positive Anticipation (Table 5).

We also tested for invariance of temperament structures across the two samples (i.e., ON and NY) to determine whether the three-, four-, and five-factor solutions derived in a joint sample are acceptable. Table G of the online supplement outlines the results of structural invariance tests (i.e., weak, strong, and strict) that were applied sequentially to the three-, four-, and five-factor solutions. Results indicated that imposition of weak, strong, and strict

invariance of the solutions did not significantly diminish model fit. Thus, the factorial structure of the instrument is equivalent across the two samples.

Higher-Order Exploratory Factor Analysis at Age 5/6

Three to five factors were extracted from the 15 lower-order factors identified at age 5/6 (Table 4 and Supplemental Table H) in the combined sample. A three-factor model yielded a marginally acceptable fit based on RMSEA of .08, but the CFI of .86 did not reach the cut-off of an acceptable fit. This model was similar to the three-factor model obtained at age 3, and thus bore some resemblance to the model of Rothbart and colleagues (2001). Thus, the first factor comprised Anger, (Low) EC, and Soothability/Falling Reactivity, the second appeared to tap lower EC and higher impulsivity, and the third resembled the construct of extraversion/surgency (see Supplemental Table H).

A four-factor model (Table 6) yielded a significantly better fit based on chi-square and CFI difference tests ($\Delta\chi^2$ (12) =135.65; p<.001; RMSEA = .06; CFI = .94; ΔCFI = .08). The first factor of this model could be interpreted as disinhibition/anger, as it consisted of (Low) EC, Anger/Frustration, and Activity Level. The second factor appeared to tap sensation-seeking, as it contained Adventurous and Quiet Play. The third factor was comprised of a combination of Smiling/Laughter and Approach/Positive Anticipation, and the fourth was largely defined by Soothability/Falling Reactivity (see Table 6). A five-factor solution was not admissible due to a negative residual variance for one of the variables and will not be considered further.

Although tests of invariance indicated that strict invariance of the three-factor solution could be assumed across the two samples, the unconstrained model for this solution was only marginally acceptable (Supplemental Table G). As a result, tests of invariance for the three-factor solution should be interpreted with caution. Table I of the Supplementary Materials outlines the differences between the three-factor solutions in the two samples. Tests of invariance also indicated that weak and strong invariance did not reduce the fit of the four-factor solution across the two samples, but strict invariance did reduce model fit (Supplemental Table G). We provide the four-factor solutions for each sample in Supplemental Table J. A five-factor model did not yield an admissible solution in the sample of 5/6-year-olds.

Discussion

We used a bottom-up approach to examining the higher- and lower-order structures of a widely used measure of child temperament, the CBQ (Rothbart et al. 1994; 2001). To our knowledge, our item-level analysis of this popular measure is unique in the literature, likely due to the difficulty in acquiring a sufficient sample size for item-level analyses of a measure as lengthy as the CBQ. Given that we had two waves of data on children ages 3 and 5/6, we conducted item-level EFAs at two time points that roughly capture the beginning and end of the developmental time frame covered by the CBQ. Findings indicated that a large number of CBQ items (55%) did not clearly differentiate between lower-order factors. Several lower- and higher-order temperament dimensions (e.g., fear and sadness) thought to be important components of temperament in most major models (Caspi & Shiner, 2006; De

Pauw, Mervielde, & Van Leeuwen, 2009; Rothbart et al., 2001) were poorly represented in the structures derived in our sample, due to purportedly relevant items failing to load onto scales. Finally, the larger structure of child temperament was not well represented by a three-factor solution in our sample, in contrast to the overarching three-factor structure posited by Rothbart and colleagues (2001). We found that a four-factor higher-order structure showed a very good fit and structural invariance across samples at ages 3 and 5/6 in our sample; further, the empirically derived four-factor structures at ages 3 and 5/6 were quite similar; thus, we focus on this model throughout this discussion.

While the CBQ is an especially lengthy measure, our findings indicate that a large number of items do not contribute to lower-order scales. More specifically, EFAs conducted at the item-level indicated that less than half of the original 195 items loaded onto lower-order factors; notably, many of the items that did not load onto a lower-order scale at age 3 (82%) also did not load onto a lower-order scale at age 5/6. Item-level analyses yielded only a handful of factors that resembled the original CBQ scales created by Rothbart and colleagues (1994; 2001). At age 3, these included High Intensity Pleasure, (Low) Shyness, (Low) Attentional Focusing, Soothability/Falling Reactivity, Approach/Positive Anticipation, Smiling/Laughter, and (Low) Activity Level; at age 5/6 only the Anger/Frustration, Smiling/Laughter, Approach/Positive Anticipation, (Low) Activity Level, and Soothability/Falling Reactivity scales were similar to Rothbart's. In other words, of the 15 lower-order scales in the original CBQ, only seven approximating these emerged from our item-level analyses at age 3, only four at age 5/6, and only three were consistently found at both ages. The remaining factors were comprised of items from multiple scales or did not represent constructs broad enough to be deemed temperament traits (e.g., one scale reflected fear of darkness). In other words, fewer than half of the scales developed by Rothbart and colleagues using a rational approach (1994; 2001) were found using a more empirical approach. These findings suggest that the CBQ is longer than necessary and that many of its items are not effective indicators of the constructs they purport to tap.

Relatedly, Putnam and Rothbart (2006) developed two shorter versions of the CBQ by examining the pattern of item-total correlations, scale content, and conducting within-scale factor analyses, rather than through item-level factor analysis (e.g., Volpe, Gadow, Blom-Hoffman, & Feinberg, 2009) or item-response theory (e.g., Sharp, Steinberg, Temple, & Newlin, 2014). Several researchers who have examined the short CBQ measures (Allan, Lonigan, & Wilson, 2013; de la Osa, Granero, Penelo, Domenech, & Ezpeleta, 2013; Sleddens, Kremers, Candel, De Vries, & Thijs, 2011) have failed to replicate the higher-order three-factor structure consisting of Surgency, NA, and EC proposed by Rothbart and colleagues (1994; 2001; 2006), raising concerns about the structure of these shortened versions. In particular, Allan et al. (2013) concluded that a large number of items of the parent and teacher versions of the very short form of the CBQ did not perform well by showing low convergent and discriminant validity with other widely used measures of child temperament. In the context of the current findings, this may be because the short versions of the CBQ use items that are not good indicators of the posited traits.

As a result of excluding approximately half of the items, several traits held to be important aspects of temperament in children (Caspi & Shiner, 2006; De Pauw et al., 2009; Rothbart et

al., 2001) were not accounted for by the lower-order factors in the structures derived in our sample. At age 3, we found evidence for a (Low) NA factor in the four-factor solution consisting of items tapping sadness and anger, but this factor also included items describing attentional, inhibitory, and perceptual sensitivity aspects of EC. At age 5/6, the NA factor in the four-factor solution similarly consisted of anger and low EC items. Difficulty in deriving clear lower-order fear and sadness factors at ages 3 and 5/6 may be related to the lack of well-functioning items that tap these constructs in the current version of the CBQ. At age 3, 10 items (83%) from the original Sadness scale and 8 items (67%) from the original Fear scale were excluded after the item-level exploratory analyses due to minimal loadings (i.e., <.40) on all lower-order factors. At age 5/6, many of the same fear and sadness items that were dropped from the age 3 analyses were dropped yet again due to low loadings (i.e., 100% of the fear items and 80% of the sadness items dropped at age 3 were also dropped at age 5/6). This pattern indicates that the CBQ may benefit from additional work developing sadness and fear items.

Similarly, analyses of lower-order factors showed that current CBQ items also failed to consistently differentiate between the various EC facets identified by Rothbart and colleagues (1994; 2001), which include Attentional Focusing, Attentional Shifting, Inhibitory Control, Low Intensity Pleasure, and Perceptual Sensitivity. Although Perceptual Sensitivity was a clearly defined lower-order factor at both ages 3 and 5/6, Low Intensity Pleasure did not replicate as a lower-order factor at either of these ages. Attentional Focusing emerged as a separate lower-order factor and Inhibitory Control items coalesced with Attentional Shifting items in the item-level EFA in 3-year-olds. However, in 5/6-year-olds, items from these three scales coalesced into a single lower-order scale (Table 3 and 4). While literature supports the general notion that EC is a multifaceted construct (Murray & Kochanska, 2002; Rothbart, Ellis, Rueda, & Posner, 2003), the CBQ does not appear to consistently differentiate between these facets, suggesting that either EC does not parse into the components the CBQ proposes exist or that revision of the CBQ EC items is needed.

While the four-factor structure found at ages 3 and 5/6 showed some conceptual similarity to that reported by Rothbart and colleagues (2001) (e.g., both contained two affective higher-order factors - an NA-like factor and Smiling/Approach), there were significant differences as well. The structure derived by Rothbart et al (2001) in multiple samples of 3- and 6-year-olds showed a single Surgency factor. Such a factor did not emerge in our analyses, although two dimensions tapping related behaviors did; one of these was characterized by Smiling/Laughter and Approach/Positive Anticipation items, and the other captured behaviors related to sensation-seeking. These findings parallel the development of Big 3 models of personality (Eysenck & Eysenck, 1985; Tellgen, 1993; Tellegen & Waller, 2008). Originally, Eysenck's model proposed the existence of two factors, Extraversion and Neuroticism, with Extraversion including a large impulsivity component. He subsequently split the impulsivity/sensation-seeking items off to form a third factor labelled Psychoticism (Eysenck & Eysenck, 1985). Our findings also parallel the distinction between Positive Emotionality and Constraint in the three-factor model and its corresponding measure (Multidimensional Personality Questionnaire) developed by Tellegen and colleagues (Tellegen, 1993; Tellegen & Waller, 2008).

Similarly, in contrast to Rothbart's three-factor model, we did not recover clearly distinct NA and EC factors at either age 3 or 5/6; instead, we found that scales tapping aspects of EC and NA, particularly anger, clustered together to form higher-order factors (see Table 5, factor 2 for the age 3 solution, Table 6, factor 1 for the age 5/6 solution. It is possible that differentiation of these factors could be related to developmental changes in the structure of temperament that occur between infancy and early childhood. In a large study of predictors of emerging EC, Gartstein, Slobodskaya, Putnam, and Kinsht (2009) found that infants' NA was a significant predictor of their EC in toddlerhood, suggesting that NA may influence the development of EC, and the possibility that common factors play an etiological role in both constructs. Such etiological overlap may result in less clearly differentiated NA and EC factors in 3–6 year olds. It is also possible that clear NA and EC factors did not emerge in our study due to a significant reduction in the number of items tapping NA and EC scales after our initial item-level EFAs. Given the level of interest on the part of developmental psychologists in these constructs, future work on the CBQ may need to focus on the development of items that successfully tap these constructs.

Also in higher-order EFAs, we recovered factors that resembled Soothability (see Table 5, Factor 3 for the relevant age 3 factor and Table 6, Factor 4, for the age 6 factor), which tends to be subsumed under the higher-order NA or Neuroticism factor in extant models of child temperament and personality (Caspi & Shiner, 2006; De Pauw et al., 2009; Rothbart et al., 2001). In our study, this factor was characterized by items tapping children's ability to recover from negative emotions, and may be tapping parent perceptions of children's emotion regulation skills. It is possible that the ease with which a child can be soothed is very salient to parents, which may account for its heightened distinction in our models relative to theoretical accounts of this construct.

One question concerns how well the structural results we obtained relate to findings derived from other approaches to the measurement of child temperament, including observational measures. Two studies (Dyson et al., 2012; Kotelnikova et al., 2013) have addressed the structure of observed temperament in early- and middle-childhood, both of which indicated that more than three factors were needed to adequately capture variance in child temperament. More specifically, Dyson and colleagues (2012) found that a five-factor model consisting of Sociability, Dysphoria (anger, hostility, and sadness), Positive Affect/Interest, Fear/Inhibition, and Impulsivity was the best fit to preschoolers' temperament. The Dysphoria factor derived by Dyson et al. (2012) resembles the lower-order (low) NA factor derived at age 3 in the current study. Further, factors tapping sensation-seeking and positive affect that emerged at both ages 3 and 5/6 in the current study resembled the Impulsivity and Positive Affect/Interest factors, respectively, in Dyson et al.'s (2012) model. Kotelnikova and colleagues (2013) analyzed observed temperament in 7-year-olds, finding a four-factor structure consisting of Positive Emotionality, Disinhibition/Anger, Sadness, and Fear/Behavioral Inhibition factors. In this study, Positive Emotionality and Disinhibition emerged as two separate factors, similar to the current study, in which two dimensions tapping positive affect and sensation-seeking were found. Overall, the structures of temperament derived in our study via a purely empirical approach are somewhat more consistent with models of observed temperament (Dyson et al., 2012; Kotelnikova et al., 2013) than Rothbart and colleagues' (2001) original model.

Our study is the first item-level analysis of a widely used parent-report measure of temperament in young children. Compared to the analytic methods used in the original scale development (Rothbart et al., 2001), the approach we used is less subject to influence by item properties (Goodwin & Leech, 2006). The large sample size and multiple waves of CBQ data were significant strengths. In particular, comparing the structure of the CBQ in the same children over time eliminates the confound of age and sample found in cross-sectional studies of different participants who vary in age. However, our study had several limitations. First, the CFI values in our item-level EFA analyses at ages 3 and 5/6 did not reach the recommended value of .90 (Bentler, 1990). However, other fit statistics (i.e., RMSEA) indicated good model fit. Second, despite the acceptable fit coefficients of the higher-order models presented in Tables 5 and 6, there were relatively few lower-order factors with high loadings. The main implication of the absence of high loading lower-order factors is that the interpretability of the broader factors is somewhat limited; we therefore tried to be agnostic in how we describe these factors throughout the manuscript. Overall, it cannot be said that the higher-order structures capture most of the scales. Although we ascertained structural invariance across the two samples, the four-factor structures derived in the two samples of 5/6-year-olds separately had minor differences (See Supplemental Table J). Also, some of our EFAs included factors with only two items; such factors may not be especially stable or replicate in future analyses. Finally, both samples were racially/ethnically homogenous, which limits the generalizability of our findings to ethnically diverse children.

Our study provides important new information on a widely used measure of child temperament, the CBQ (Rothbart et al., 1994; 2001). The results of our study suggest that revisions of the CBQ are needed, which could include the elimination of poorly functioning items, the development of new items to tap important temperamental constructs that may not be currently represented well, and reconsidering the number of factors required to fully represent the domain of temperament in early to middle childhood. Such revisions may greatly benefit researchers in the fields of child development, developmental psychopathology, and temperament assessment.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Sample Descriptive Statistics

	ON		NY	
Sample:	**Baseline**	**Follow-up**	**Baseline**	**Follow-up**
N	406	380	538	473
M child age (*SD*)	3.02 (.16)	5.44 (.50)	3.55 (.26)	6.01 (1.78)
% boys	49%	49%	53%	54%
M PPVT (*SD*)	112 (14)	113 (12)	103 (14)	108 (11)
% of caregivers who were mothers	94%	90%	96%	91%
M caregiver age (*SD*)	33.25 (4.62)	--	35.98 (4.35)	--
Ethnicity:				
Caucasian	93%	93.50%	87%	79%
African	.50%	.50%	1%	5%
Asian	2%	2%	1%	2%
Hispanic/Latino	2%	2%	3%	5%
Other	2.5%	2%	8%	9%
Family income:				
<20,000	4%	3%	1%	2%
20,001–40,000	11%	12%	4%	8%
40,001 – 70,000	24%	20%	21%	23%
70,001–100,000	30%	25%	35%	32%
>100,000	31%	40%	39%	35%

Note. ON – sample collected in London, ON; NY – sample collected in Long Island, New York, USA.

Table 2

Descriptive Statistics for the 15 Original CBQ Scales

Scale	ON: age 3			NY: age 3			*d* age 3	ON: age 5/6			NY: age 5/6			*d* age 5/6
	M	***SD***	α	***M***	***SD***	α		***M***	***SD***	α	***M***	***SD***	α	
1. Activity	5	.72	.77	5.02	.77	.76		4.74	.77	.77	4.82	.73	.74	
2. Anger	4.44*	.77	.79	4.56*	.82	.79	.15	4.25	.91	.85	4.23	.88	.82	
3. Approach	5.17**	.61	.74	5.32**	.64	.71	.24	5.20	.63	.75	5.21	.63	.71	
4. AttnFocus	4.47	.79	.72	4.53	.88	.72		4.74	.83	.76	4.73	.82	.71	
5. Discomfort	4.05**	.83	.71	4.23**	.84	.68	.22	4.03	.88	.76	4.03	.84	.70	
6. Sooth	5	.72	.77	5.06	.75	.74		5.05**	.73	.80	5.19**	.77	.80	.19
7. Fear	3.62**	.83	.71	3.98**	.94	.74	.43	3.64**	.93	.74	3.83**	.95	.75	.20
8. HighPL	4.95**	.82	.80	5.12**	.88	.79	.20	4.93	.90	.85	4.99	.81	.81	
9. Impulsivity	4.56*	.73	.79	4.67*	.79	.75	.14	4.41	.78	.80	4.45	.74	.75	
10. InhibCn	4.71	.75	.79	4.61	.81	.79		5.10	.80	.82	5.01	.84	.82	
11. LowPL	5.65*	.56	.72	5.74*	.58	.69	.16	5.58	.59	.73	5.53	.61	.73	
12. PerSen	4.85**	.75	.73	5.14**	.77	.74	.38	4.95**	.75	.76	5.10**	.71	.74	.21
13. Sadness	3.79**	.70	.68	3.95**	.71	.63	.23	3.94	.71	.66	3.86	.72	.66	
14. Shyness	3.57	1.16	.92	3.51	1.24	.92		3.40*	1.15	.92	3.19*	1.26	.93	.17
15. Smiling	5.87**	.59	.79	6.02**	.54	.73	.27	5.90	.55	.78	5.97	.54	.75	

Note. The table depicts between sample comparisons of the CBQ scale means within each age group (3-year-olds and 5/6-year-olds);

** $p<.01$;

* $p<.05$;

Activity = Activity Level; Anger = Anger/Frustration; Approach = Approach/Positive Anticipation; AttnFocus = Attentional Focusing; Sooth = Soothability/Falling Reactivity; HighPL = High Intensity Pleasure; InhibCn = Inhibitory Control; LowPL = Low Intensity Pleasure; PerSen = Perceptual Sensitivity; Smiling = Smiling/Laughter

Table 3

Exploratory Factor Analysis of the CBQ Items at Age 3

Item#	Scale	item description	HighPL	LowShy	Imp	NoticeAp	Low AttnFocus	Ang/Sad	Ang AbtBed	LowActiv	Smiling	NotUpset WPain	InhibCn/ AttnShift	Approach	FearDark	Sooth	FearOf LoudNoise
60	HighPL	DoesNotLikeHighSlides	**−0.83**	0.01	0.04	0.05	−0.02	−0.01	−0.01	0.03	−0.03	0.00	0.01	−0.01	0.03	−0.01	−0.06
8	HighPL	Adventurous	**0.82**	0.03	0.06	−0.05	−0.01	−0.01	0.02	−0.01	0.00	−0.02	0.05	0.04	−0.05	0.01	0.12
51	HighPL	DoesNotLikeTakingChances	**−0.50**	−0.11	−0.09	0.00	0.06	0.02	0.05	−0.01	−0.09	−0.01	0.11	0.07	0.00	−0.05	0.08
161	Fear	NotAfraidOfHeights	**0.47**	0.02	0.02	0.04	−0.03	−0.04	0.06	0.02	−0.05	0.10	0.03	0.04	−0.17	−0.03	0.03
139	HighPL	LikesToGoHighFastWhenOnSwing	**0.43**	−0.05	0.10	0.10	0.08	−0.04	0.04	0.12	0.00	0.03	0.03	−0.05	−0.05	−0.01	0.00
129	Shy	TalksEasilyToNewPeople	−0.02	**0.87**	−0.01	0.05	0.03	0.04	0.01	0.02	0.09	0.04	0.06	−0.03	−0.01	−0.03	0.04
106	Shy	ActsShyAroundNewPeople	−0.01	**−0.82**	0.01	0.01	0.01	0.00	0.01	0.03	0.08	−0.02	0.11	−0.04	−0.05	0.01	0.11
23	Shy	AtEaseWithAnyone	0.02	**0.79**	0.10	−0.01	0.04	0.03	0.04	0.12	0.02	−0.02	0.09	−0.07	0.00	0.02	0.06
183	Impulsivity	SlowToWarmToOthers	−0.02	**−0.77**	0.05	0.02	0.00	−0.02	−0.01	0.07	−0.02	0.04	0.01	0.00	0.00	−0.05	0.01
143	Shy	TurnsAwayShylyFromNewPeople	−0.01	**−0.75**	0.01	0.00	0.02	−0.01	0.04	0.10	0.07	−0.03	0.14	−0.02	−0.04	0.01	0.15
158	Shy	AtEaseWithAnyGroup	0.02	**0.75**	0.01	0.03	0.08	−0.03	0.01	0.06	0.10	−0.04	0.12	−0.05	−0.05	−0.03	0.04
57	Shy	JoinsOthersQuicklyEvenIfStranges	−0.04	**0.73**	0.03	0.03	0.01	0.04	−0.01	0.05	0.02	0.00	−0.03	0.00	−0.05	0.03	−0.01
17	Shy	ComfortableMeetOthers	−0.02	**0.66**	−0.02	0.03	0.03	0.02	0.05	0.03	0.01	0.05	0.10	−0.10	−0.01	0.00	0.04
89	Shy	NervousWhenTalkingToAdultsJustMet	0.02	**−0.61**	−0.02	0.01	0.00	0.07	0.06	0.13	0.10	0.05	0.08	0.01	0.02	0.04	0.13
179	Smiling	SmilesAtFriendlyStrangers	−0.04	**0.66**	0.02	0.00	0.00	0.01	−0.01	0.06	0.17	0.01	−0.01	0.02	0.02	−0.04	0.05
71	Impulsivity	LongTimeInApproachNewSituations	−0.14	**−0.59**	0.02	0.01	0.10	0.03	0.01	0.10	0.06	0.01	0.03	0.09	0.00	−0.05	0.06
45	Shy	ActsFriendlyWithNewChildren	−0.04	**0.58**	0.01	0.01	−0.02	−0.01	0.00	0.02	0.15	0.01	0.07	0.02	−0.01	0.03	0.09
37	Shy	GetsEmbarrassedWhenStrangersPayAttn	0.02	**−0.58**	−0.01	0.01	0.02	0.09	0.01	0.12	0.01	0.03	0.11	−0.02	−0.02	0.01	0.05
119	Shy	IsComfortableAskingOtherChildrenToPlay	−0.04	**0.51**	−0.02	−0.01	0.01	−0.03	0.02	−0.02	0.18	0.00	0.06	0.01	−0.03	0.04	0.09
74	Shy	ShyEvenWithPeopleWhoKnowsForLongTime	−0.02	**−0.50**	0.06	0.08	0.01	0.02	−0.01	0.19	−0.03	−0.01	0.01	0.00	−0.05	−0.05	0.10
77	HighPL	EnjoysCrowdsofPeople	0.09	**0.42**	0.06	0.01	0.00	−0.05	0.05	0.06	0.00	0.02	0.15	0.05	−0.03	0.04	−0.15
159	HighPL	DislikesRowdyGames	***−0.32***	0.01	**−0.53**	0.03	0.09	−0.07	0.04	0.12	−0.08	−0.06	−0.01	0.22	−0.06	0.02	0.18
30	HighPL	DoesNotCareForRoughGames	***−0.32***	0.00	**−0.52**	−0.01	0.11	−0.07	0.05	0.15	−0.04	−0.06	−0.05	0.17	−0.07	0.06	0.14
25	Activity	RunsVsWalks	0.07	0.06	**0.52**	−0.01	−0.04	−0.04	0.02	−0.02	0.02	−0.02	−0.14	0.15	−0.04	0.02	0.14
22	HighPL	PlaysWildRecklessly	0.24	−0.01	**0.50**	0.03	0.02	0.06	0.02	0.06	−0.02	0.07	−0.13	0.02	0.02	−0.03	−0.01
48	Activity	ClimbsInHouse	0.16	−0.05	**0.44**	0.06	0.04	−0.03	0.04	−0.08	0.11	−0.05	−0.04	−0.02	−0.02	0.07	0.03

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Item#	Scale	item description	HighPL	LowShy	Imp	NoticeAp	Low AttnFocus	Ang/Sad	Ang AbtBed	LowActiv	Smiling	NotUpset WPain	InhibCn/ AttnShift	Approach	FearDark	Sooth	FearOf LoudNoise
172	Activity	FullOfEnergyInTheEvening	0.05	0.05	**0.41**	0.06	0.04	−0.06	0.11	−0.04	0.15	0.01	−0.06	0.05	−0.02	0.01	−0.04
26	Impulsivity	InterruptsOthers	−0.07	0.10	**0.40**	0.10	0.12	0.11	0.03	−0.06	0.04	−0.09	0.01	0.00	−0.10	0.01	0.04
65	PerSen	CommentsOnChangesInParentAppearance	−0.06	0.05	0.02	**0.85**	−0.01	−0.03	−0.02	0.04	0.00	0.00	0.02	0.03	−0.01	−0.01	0.00
28	PerSen	DoesNotCommentOnChangesInAppearance	0.03	−0.02	−0.02	**−0.78**	0.08	0.01	−0.02	0.07	−0.02	0.00	0.05	0.06	0.01	−0.01	−0.03
31	PerSen	NoticesNewClothing	0.01	0.02	−0.06	**0.77**	0.04	−0.08	0.01	0.02	0.00	0.01	0.00	0.08	−0.03	−0.08	−0.03
38	AttnFocus	HasAHardTimeKeepingMindOnActiv	−0.05	−0.04	−0.03	−0.02	**0.58**	0.04	0.00	0.03	−0.04	0.02	−0.13	0.07	0.01	0.00	0.06
171	AttnFocus	EasilyDistractedWhenListeningToStory	0.06	−0.11	0.05	−0.02	**0.57**	0.02	0.01	−0.01	0.11	0.01	0.01	−0.01	0.03	−0.03	0.01
144	AttnFocus	BecomesInvolvedWorksForLongPeriods	0.04	−0.07	0.26	−0.10	**−0.56**	0.00	−0.02	0.25	0.04	−0.09	0.02	0.02	0.01	0.05	0.00
47	AttnFocus	MovesFromOneTaskToAnotherWithouCompleti	n −0.03	0.05	0.17	−0.03	**0.53**	0.01	0.06	0.02	0.01	−0.02	0.00	0.05	0.07	0.00	0.00
126	Activity	PlaysGamesSlowlyDeliberately	−0.05	−0.01	−0.01	0.06	**−0.45**	0.04	0.01	0.26	0.00	0.05	0.16	−0.04	0.02	−0.05	0.03
195	AttnFocus	TroublConcentratingWhenDistractingNoises	0.04	−0.09	0.03	0.01	**0.44**	0.06	−0.05	−0.07	0.09	0.02	−0.11	0.03	0.08	−0.06	0.15
125	AttnFocus	GoodConcentrationWhenDrawing	0.06	−0.03	−0.02	0.03	**−0.43**	−0.01	0.03	0.17	0.10	−0.07	0.00	0.05	0.00	−0.05	0.01
32	InhibCn	HardTimeFollowingInstructions	−0.02	0.03	0.02	−0.06	***0.40***	0.06	0.03	0.18	0.09	0.01	**−0.41**	−0.03	0.01	0.00	0.00
173	Anger	EasilyIrritatedWhenTroubleWithTask	0.00	0.00	0.03	−0.05	0.11	**0.53**	−0.02	−0.09	0.01	0.01	−0.09	0.01	−0.04	−0.03	0.02
149	Sadness	RarelyDiscouragedWhenTroubleDoingSmth	0.02	0.00	0.02	0.00	0.02	**−0.50**	−0.03	0.27	−0.01	0.05	0.05	0.10	0.02	−0.12	−0.07
128	Anger	EasilyFrustratedWhenTired	−0.01	0.04	−0.01	−0.09	−0.04	**0.49**	0.09	−0.09	0.06	−0.01	−0.05	−0.03	−0.01	0.00	0.09
78	Anger	AngryWhenCantFindSmthWantsToPlayWith	0.00	−0.02	0.09	−0.05	0.01	**0.47**	0.00	0.05	−0.02	−0.04	0.00	0.15	0.00	−0.04	−0.09
62	Anger	FustratedWhenPreventedFromDoingThings	−0.03	0.03	0.17	0.05	0.03	**0.45**	0.06	0.02	−0.10	−0.09	−0.17	0.06	−0.05	−0.04	−0.04
19	Anger	RarelyIrritatedWhenMakesMistake	−0.04	−0.03	0.05	−0.02	0.12	**−0.44**	0.03	0.17	−0.03	0.08	−0.05	−0.01	0.01	−0.02	−0.07
55	Sadness	DepressedWhenCannotCompleteTask	0.00	−0.01	0.05	−0.01	−0.06	**0.44**	−0.01	0.13	−0.05	0.02	0.14	0.10	0.01	−0.09	0.12
34	Anger	HasTemperTantrums	−0.04	0.02	0.13	0.00	0.03	**0.42**	0.15	0.01	−0.02	0.01	−0.17	−0.03	−0.05	−0.18	−0.09
193	Anger	GetsMadWhenProvoked	0.02	−0.06	0.04	0.02	0.08	**0.40**	−0.05	0.08	0.06	0.00	−0.08	−0.10	0.09	−0.01	−0.06
120	Anger	RarelyGetsUpsetWhenToldToGoToBed	−0.03	0.01	0.00	−0.03	0.07	−0.02	**−0.83**	0.02	0.03	0.09	0.02	0.02	−0.07	−0.04	0.09
2	Anger	AngryWhenAskedtoGotoBed	−0.02	0.03	0.03	−0.03	0.04	0.13	**0.72**	0.05	0.03	−0.02	0.01	0.04	0.06	0.01	−0.11
103	Soothability	FallsAsleepIn10Min	−0.03	−0.01	−0.02	0.01	0.01	0.11	**−0.55**	0.07	0.07	0.00	0.00	0.04	−0.06	0.09	−0.04
41	Activity	SitsQuietlyOutside	−0.02	0.02	−0.25	0.02	−0.07	0.03	0.01	**0.49**	−0.04	−0.03	−0.05	−0.03	0.06	0.02	−0.08
88	Activity	SitsQuitelyForLongPeriods	0.01	−0.05	−0.05	−0.05	−0.16	0.12	0.03	**0.45**	−0.02	−0.08	0.00	−0.07	−0.01	0.10	−0.05
36	LowPL	EnjoysSittingInSunshine	0.07	−0.02	−0.29	0.08	−0.09	−0.09	−0.03	**0.44**	0.11	−0.06	0.01	−0.01	0.06	−0.02	−0.02
192	Activity	LikesToSitQuieltyandWatchPplDoThings	−0.08	−0.15	−0.21	0.04	−0.15	−0.01	−0.01	**0.43**	0.08	0.00	0.01	−0.09	−0.02	−0.02	−0.03

Item#	Scale	item description	HighPL	LowShy	Imp	NoticeAp	Low AttnFocus	Ang/Sad	Ang AbtBed	LowActiv	Smiling	NotUpset WPain	InhibCn/ AttnShift	Approach	FearDark	Sooth	FearOf LoudNoise
102	Activity	PrefersQuietActivVsGames	−0.14	0.00	−0.28	0.03	−0.15	0.01	0.02	**0.40**	−0.07	−0.04	−0.03	−0.15	−0.03	0.02	0.03
163	Smiling	LaughsOutLoudInPlayWithChildren	−0.06	0.06	0.06	0.02	0.05	−0.01	−0.03	0.05	**0.70**	0.03	0.04	0.03	−0.01	−0.05	−0.03
99	Smiling	SeldomLaughLoudDuringPlay	−0.01	−0.05	0.00	−0.05	−0.02	0.09	−0.04	0.05	**−0.64**	0.02	0.00	0.04	0.03	0.01	−0.02
135	Smiling	DoesntGiggleOrActSilly	−0.06	0.02	−0.08	−0.04	−0.05	−0.01	−0.02	0.10	**−0.52**	0.04	0.05	0.02	0.01	−0.12	0.06
152	Smiling	SmilesAtPeopleWhoLikes	0.02	0.12	−0.04	0.01	−0.02	−0.09	−0.02	0.00	**0.49**	0.04	−0.02	0.07	0.00	0.02	0.07
165	Smiling	RarelyLaughsAloudWhenWatchingComedies	−0.03	0.01	0.05	−0.01	0.02	−0.08	0.03	0.02	**−0.48**	−0.04	0.01	0.00	−0.04	−0.02	0.05
11	Smiling	LaughsAtJokes	0.05	0.05	0.04	−0.03	−0.02	0.05	0.03	−0.02	**0.46**	−0.02	0.03	0.06	−0.04	0.10	0.03
153	Activity	PlaysActivelyOutdoorsWithChildren	0.01	0.14	0.10	−0.01	0.02	0.01	−0.05	−0.05	**0.44**	0.04	0.08	0.02	0.00	−0.01	0.03
110	Smiling	SmilesGigglesPlayingBySelf	−0.02	−0.01	0.13	−0.02	−0.03	0.07	0.00	0.12	**0.44**	0.09	0.08	0.06	−0.01	0.07	−0.01
101	Discomfort	NotUpsetByCutsBruises	0.01	0.01	−0.03	0.04	0.04	−0.02	−0.02	0.01	−0.01	**0.81**	0.01	0.01	−0.04	0.04	−0.03
61	Discomfort	UpsetByALitteCutBruise	−0.06	0.06	0.07	0.05	0.05	0.04	0.02	0.10	−0.01	**−0.76**	0.03	0.06	−0.03	−0.03	0.07
132	Discomfort	LikelyToCryWhenABitHurt	−0.05	−0.02	−0.02	−0.04	0.02	0.12	0.01	0.06	−0.01	**−0.59**	0.05	0.03	0.01	−0.05	−0.03
85	Soothability	ForgetsBumpsScapesAfterCoupleMin	0.02	0.07	0.06	−0.07	0.02	0.07	−0.02	0.01	0.00	**0.50**	0.02	−0.02	0.04	0.19	0.03
168	InhibCn	CanEasilyStopWhenToldNo	−0.03	0.01	−0.03	−0.03	−0.08	−0.16	−0.12	0.09	0.03	−0.08	**0.55**	0.00	0.02	0.04	−0.05
29	AttnShift	ShiftsEasilyFromOneActivityToAnother	0.01	0.10	0.12	−0.02	0.00	−0.04	−0.06	−0.10	0.10	−0.08	**0.45**	0.01	0.01	0.09	−0.14
95	AttnShift	TroubleStoppingActivity	−0.08	0.00	0.12	−0.05	0.03	0.14	0.14	0.11	0.02	0.01	**−0.41**	0.08	−0.01	0.00	0.15
185	InhibCn	AbleToResistTemptation	−0.01	−0.07	−0.07	−0.06	−0.23	−0.03	−0.02	0.01	0.05	0.01	**0.44**	0.00	−0.08	0.03	0.17
117	Approach	ExcitedBeforeOuting	−0.08	−0.01	0.03	0.02	0.03	0.05	0.00	−0.11	0.17	0.02	0.06	**0.60**	0.01	0.03	−0.05
96	Approach	ExcitedWhenPlanningTrips	−0.02	−0.01	0.03	0.05	−0.04	0.10	−0.09	0.01	0.02	0.02	0.16	**0.55**	0.05	0.05	−0.05
191	Approach	LooksFwdFamilyOutingsButNotExcited	−0.03	−0.02	0.05	−0.05	0.00	0.02	0.01	0.16	−0.10	0.03	0.06	**−0.48**	−0.04	−0.01	0.03
131	Approach	CalmBeforeOuting	0.01	0.06	−0.10	−0.03	−0.02	0.04	−0.03	0.18	−0.09	0.01	0.15	**−0.47**	0.03	0.06	0.01
46	Impulsivity	GoesAfterWhatHe/SheWants	0.09	0.18	0.12	0.03	0.00	0.10	−0.01	−0.04	−0.02	0.03	−0.02	0.11	0.03	0.03	−0.01
130	Fear	AfraidOfTheDark	−0.05	0.05	0.12	−0.06	0.04	−0.07	0.06	0.03	−0.03	0.00	0.04	0.00	**0.79**	0.01	0.02
70	Fear	NotAfraidOfDark	0.04	−0.05	−0.03	0.01	0.02	0.10	−0.07	0.05	0.01	0.00	0.01	0.02	**−0.76**	0.04	0.00
134	Soothability	EasyToSoothe	0.03	0.06	−0.07	0.01	0.00	−0.16	−0.03	0.05	0.02	0.05	0.03	0.09	0.01	**0.65**	−0.02
150	Soothability	DifficultToSootheWhenUpset	−0.02	0.03	0.12	−0.06	0.02	0.17	−0.02	0.05	−0.07	−0.09	0.05	0.02	0.01	**−0.62**	0.01
118	Soothability	CheersQuicklyIfUpset	−0.03	0.06	0.05	0.01	0.10	−0.01	0.03	0.04	0.07	0.13	0.21	0.09	0.02	**0.51**	−0.03
92	Soothability	ChangesFeelingsFast	−0.04	0.04	0.14	0.06	0.12	0.01	0.02	0.00	0.06	0.09	0.12	0.05	0.02	**0.49**	0.00
177	Soothability	DoesntCryForMoreThanCoupleMinutes	−0.02	0.03	0.05	−0.06	0.02	−0.14	−0.08	0.00	−0.01	0.07	0.11	−0.02	−0.12	**0.47**	0.09

Item#	Scale	item description	HighPL	LowShy	Imp	NoticeAp	Low AttnFocus	Ang/Sad	Ang AbtBed	LowActiv	Smiling	NotUpset WPain	InhibCn/ AttnShift	Approach	FearDark	Sooth	FearOf LoudNoise
68	Soothability	WhenAngryUpsetFor10MinOrLonger	−0.01	−0.04	0.08	0.04	0.05	0.27	0.03	0.18	0.04	−0.02	−0.06	0.05	0.03	−**0.41**	−0.10
178	Discomfort	BotheredByLoudSounds	0.00	−0.06	0.03	0.08	0.06	0.00	−0.04	−0.03	−0.08	−0.07	0.00	−0.02	0.11	0.01	**0.53**
50	Fear	AfraidOfLoudNoises	−0.08	−0.06	0.06	0.02	0.04	−0.01	−0.06	0.06	−0.03	−0.07	0.00	−0.01	0.18	0.00	**0.48**
151	LowPL	LikesSoundsOfWordsNurseryRhymes	0.07	0.07	−0.04	−0.01	−0.17	−0.04	−0.01	0.03	0.17	−0.03	0.04	0.08	−0.01	0.03	0.09

Note. Primary loadings of ≥.40 are bolded; secondary loadings of ≥.30 were bolded and italicized; two factors had a single item loading on them, i.e., “Like sounds of words and nursery rhymes” and “Goes after what he/she wants”, the latter loading was <.40; these two scales were excluded from higher-order exploratory factor analysis; HighPL = High Intensity Pleasure, LowShy = low Shyness, Imp = Impulsivity; NoticeAp = Notices Appearances; LowAttnFoc = low Attentional Focusing; Ang/Sad = Anger and Sadness; AngAbtBed = Anger about going to bed; LowActiv = low Activity Level; Smiling = Smiling/Laughter; NotUpsetWithPain = Not upset by physical pain and bruises; InhibCn/AttnShift = Inhibitory Control/Attentional Shifting; Approach = Approach/Positive Anticipation; FearDark = Fear of darkness; Sooth=Soothability/Falling Reactivity; FearofLoudNoises = Fear of loud noises

Table 4

Exploratory Factor Analyses of the CBQ Items at Age 5/6

Item#	Scale	Item description	Anger	Low EC	Sociability	NoticeAp	Advent	QuietP	Smiling	NotUpset WPain	Approach	(Low) Activity	Irritated Mistakes	FearDark	Sooth	FearOfLoud Noise	NotUpset SadStories
34	Anger	HasTemperTantrums	**0.58**	0.09	0.04	0.05	−0.09	−0.03	−0.05	−0.04	0.00	0.02	0.05	0.04	−0.11	−0.10	−0.03
2	Anger	AngryWhenAskedtoGotoBed	**0.57**	0.03	0.02	0.01	0.01	0.03	−0.02	0.03	−0.06	0.00	−0.01	0.00	0.05	−0.03	0.02
62	Anger	FustratedWhenPreventedFromDoingThings	**0.53**	0.04	0.06	0.01	−0.03	−0.07	−0.01	−0.10	0.07	−0.03	0.21	−0.02	−0.07	0.07	0.01
181	Anger	AngryWhenCalledInFromPlay	**0.45**	0.12	0.00	−0.03	0.00	0.03	0.00	0.03	0.02	−0.04	0.12	0.06	0.02	0.02	0.02
78	Anger	AngryWhenCantFindSmthWantsToPlayWith	**0.41**	0.05	−0.01	0.05	0.06	−0.02	−0.01	−0.08	0.01	−0.05	0.33	0.00	−0.01	−0.02	−0.04
95	AttnShift	TroubleStoppingActivity	**0.40**	***0.33***	0.00	−0.08	−0.06	0.08	0.05	0.15	0.04	0.09	0.06	−0.01	−0.07	0.05	0.01
38	AttnFocus	HasAHardTimeKeepingMindOnActiv	−0.04	**0.75**	−0.04	−0.01	0.00	0.08	−0.03	−0.01	−0.02	0.03	0.12	−0.02	0.09	−0.08	−0.06
32	InhibCn	HardTimeFollowingInstructions	0.06	**0.75**	0.01	0.04	0.05	0.08	0.03	0.07	0.01	0.02	−0.08	0.00	−0.08	−0.06	−0.01
136	InhibCn	GoodAtFollowingInstructions	0.01	**−0.74**	0.02	0.03	−0.05	0.02	0.06	0.02	−0.03	0.02	0.05	0.05	0.00	0.11	0.04
47	AttnFocus	MovesFromOneTaskToAnotherWithouCompleting	−0.02	**0.74**	−0.01	0.04	0.03	−0.01	−0.05	−0.08	−0.04	−0.02	0.04	−0.06	0.11	−0.09	−0.01
171	AttnFocus	EasilyDistractedWhenListeningToStory	−0.05	**0.63**	−0.04	0.05	0.00	0.04	−0.06	−0.05	−0.01	−0.15	0.12	−0.09	0.07	−0.02	0.05
195	AttnFocus	TroublConcentratingWhenDistractingNoises	0.03	**0.54**	−0.04	0.04	0.09	0.16	0.04	−0.02	−0.02	−0.10	0.19	0.06	0.14	0.12	−0.04
13	Impulsivity	RushesIntoActivWithoutThinking	−0.05	**0.54**	0.14	−0.07	0.06	−0.16	−0.11	−0.01	0.14	−0.01	0.01	0.06	0.04	0.04	−0.01
108	InhibCn	TroubleSittingStillWhenTold	0.12	**0.51**	0.00	−0.02	−0.03	−0.10	0.11	−0.02	0.02	−0.05	−0.04	0.01	−0.06	0.11	0.02
79	Impulsivity	StopsThinksBeforeDoing	−0.09	**−0.51**	−0.05	0.07	−0.02	0.17	−0.02	0.07	0.01	0.12	0.13	−0.08	−0.03	0.10	−0.02
125	AttnFocus	GoodConcentrationWhenDrawing	0.17	**−0.45**	−0.01	0.03	0.10	0.01	0.08	−0.03	0.05	0.21	0.01	0.03	−0.04	0.12	−0.06
104	Impulsivity	SaysWhatComestoMind	0.05	**0.45**	0.10	0.01	0.01	−0.11	−0.05	−0.02	0.11	0.07	0.01	0.05	−0.01	0.10	0.06
16	AttnFocus	KeepsAtTaskUntilDone	−0.06	**−0.44**	−0.03	0.01	0.05	−0.01	0.01	0.00	0.02	0.02	−0.06	−0.07	0.01	0.14	−0.01
184	AttnShift	DoesntSeemToHearWhenTalkedTo	0.16	**0.43**	−0.03	−0.08	0.06	0.02	0.05	0.07	0.04	0.07	0.01	0.03	−0.03	0.07	0.08
144	AttnFocus	BecomesInvolvedWorksForLongPeriods	0.21	**−0.42**	−0.04	−0.04	0.04	−0.12	0.01	0.14	0.06	***0.31***	−0.06	0.01	0.01	0.25	−0.01
126	Activity	PlaysGamesSlowlyDeliberately	0.08	**−0.40**	0.02	0.01	0.05	0.03	−0.08	0.03	−0.02	***0.33***	0.04	0.07	−0.03	0.09	0.09
20	InhibCn	GoodAtSimonSays	0.02	**−0.40**	−0.03	0.04	0.04	−0.04	0.07	−0.04	0.10	0.01	−0.02	0.03	0.01	−0.04	0.05
129	Shy	TalksEasilyToNewPeople	0.03	0.03	**0.92**	0.02	0.02	0.10	0.02	0.00	−0.05	0.01	0.04	−0.01	−0.01	0.05	−0.01
106	Shy	ActsShyAroundNewPeople	−0.07	−0.04	**−0.85**	−0.02	0.01	0.01	0.08	−0.03	0.04	0.08	−0.02	0.01	0.00	0.02	−0.09
183	Impulsivity	SlowToWarmToOthers	0.10	0.00	**−0.83**	0.00	0.01	0.00	0.00	−0.03	0.03	0.05	−0.03	0.00	0.02	−0.03	0.06
23	Shy	AtEaseWithAnyone	0.00	−0.01	**0.81**	−0.04	−0.01	0.06	−0.03	−0.01	0.00	0.06	0.00	−0.03	−0.04	0.01	0.07

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Item#	Scale	Item description	Anger	Low EC	Sociability	NoticeAp	Advent	QuietP	Smiling	NotUpset WPain	Approach	(Low) Activity	Irritated Mistakes	FearDark	Sooth	FearOfLoud Noise	NotUpset SadStories
57	Shy	JoinsOthersQuicklyEvenIfStranges	−0.02	0.09	**0.77**	0.00	−0.06	0.00	0.03	0.02	0.02	0.04	0.03	−0.05	−0.02	0.04	0.01
158	Shy	AtEaseWithAnyGroup	−0.02	0.01	**0.75**	−0.03	0.01	−0.01	0.06	0.00	−0.01	0.03	−0.01	0.03	0.05	−0.01	−0.04
143	Shy	TurnsAwayShylyFromNewPeople	−0.01	−0.06	**−0.73**	−0.04	0.01	−0.03	0.02	−0.05	0.04	0.13	0.00	−0.05	0.00	0.05	−0.03
89	Shy	NervousWhenTalkingToAdultsJustMet	0.01	−0.01	**−0.71**	−0.06	−0.02	−0.02	0.03	0.01	0.06	0.08	0.09	−0.07	−0.02	−0.02	−0.14
17	Shy	ComfortableMeetOthers	−0.01	−0.07	**0.70**	−0.03	0.07	0.05	0.00	0.02	0.03	0.03	−0.03	−0.01	0.01	−0.02	0.00
179	Smiling	SmilesAtFriendlyStrangers	−0.14	0.13	**0.69**	0.06	−0.06	0.00	0.09	−0.02	−0.02	0.15	0.12	0.02	−0.04	−0.06	−0.02
37	Shy	GetsEmbarrassedWhenStrangersPayAttention	−0.01	0.00	**−0.62**	−0.01	0.03	0.04	0.02	0.05	0.02	−0.03	0.01	0.04	−0.01	0.04	−0.05
45	Shy	ActsFriendlyWithNewChildren	0.03	0.05	**0.62**	−0.02	0.01	−0.03	0.14	−0.01	−0.02	−0.02	−0.04	0.00	0.02	0.05	−0.18
71	Impulsivity	LongTimeInApproachNewSituations	0.12	0.10	**−0.61**	0.05	−0.05	0.16	0.00	0.05	−0.03	0.08	−0.01	0.02	−0.06	0.03	0.02
74	Shy	ShyEvenWithPeopleWhoKnowsForLongTime	0.04	0.06	**−0.58**	0.04	0.04	0.04	0.02	−0.02	−0.06	0.11	−0.06	0.03	−0.06	0.11	−0.05
59	Impulsivity	RushesIntoNewSituations	0.04	0.24	**0.55**	0.00	0.03	−0.22	−0.11	−0.06	0.05	0.04	−0.02	0.01	0.00	0.05	0.00
119	Shy	IsComfortableAskingOtherChildrenToPlay	0.03	−0.03	**0.53**	−0.05	0.01	0.00	0.13	0.07	0.02	−0.06	−0.08	0.00	0.00	0.06	−0.23
77	HighPL	EnjoysCrowdsofPeople	−0.02	0.01	**0.44**	0.04	0.10	−0.08	0.04	0.02	0.04	0.05	0.03	−0.09	0.03	−0.12	0.01
7	Shy	PrefersToWatchVsJoinPlaying	−0.03	0.12	**−0.42**	0.08	−0.02	0.17	−0.04	−0.02	−0.10	0.12	0.05	−0.02	−0.03	0.07	0.14
65	PerSen	CommentsOnChangesInParentAppearance	−0.01	0.00	0.02	**0.87**	−0.04	0.02	0.05	0.07	0.03	0.04	0.01	0.07	−0.04	−0.04	0.01
31	PerSen	NoticesNewClothing	0.00	−0.01	0.00	**0.82**	0.00	0.03	0.04	0.00	−0.04	−0.01	−0.08	−0.01	−0.09	0.02	−0.01
28	PerSen	DoesNotCommentOnChangesInAppearance	0.12	−0.01	−0.03	**−0.71**	0.09	0.09	−0.07	−0.03	0.00	−0.04	−0.07	−0.07	0.01	0.01	0.00
98	PerSen	QuicklyAwareOfNewItemInLivingRoom	0.04	−0.04	0.01	**0.46**	0.06	0.05	0.07	0.00	0.09	−0.02	0.00	−0.01	0.10	0.16	0.02
8	HighPL	Adventurous	−0.03	0.11	0.05	−0.04	**0.70**	−0.24	0.05	0.01	−0.04	0.01	0.02	0.02	−0.03	0.06	−0.02
60	HighPL	DoesNotLikeHighSlides	0.07	−0.04	−0.05	0.02	**−0.68**	0.28	0.00	0.02	0.00	0.04	−0.01	0.03	0.03	0.00	0.06
139	HighPL	LikesToGoHighFastWhenOnSwing	−0.01	0.01	−0.03	0.06	**0.50**	−0.20	0.02	−0.04	0.07	−0.02	−0.06	0.00	0.00	0.08	0.07
161	Fear	NotAfraidOfHeights	0.02	−0.09	0.00	−0.02	**0.44**	−0.14	−0.05	0.00	0.02	−0.01	−0.06	−0.10	−0.08	0.00	0.18
51	HighPL	DoesNotLikeTakingChances	0.03	−0.02	−0.11	−0.02	***−0.35***	**0.42**	−0.03	−0.02	−0.01	0.01	0.11	0.01	0.00	0.13	0.09
30	HighPL	DoesNotCareForRoughGames	0.07	−0.03	0.00	0.00	−0.01	**0.76**	−0.08	−0.05	0.12	−0.02	−0.26	0.00	−0.02	0.01	−0.05
159	HighPL	DislikesRowdyGames	0.04	0.00	0.03	0.04	−0.02	**0.72**	−0.07	−0.07	0.08	0.00	−0.27	−0.01	−0.03	0.07	−0.05
182	HighPL	EnjoysRidingBikeFastRecklessly	0.01	0.23	−0.01	0.04	0.15	**−0.48**	−0.06	0.02	−0.01	0.04	0.07	0.07	−0.08	−0.02	0.06
163	Smiling	LaughsOutLoudInPlayWithChildren	0.02	0.04	0.07	−0.04	0.04	−0.03	**0.64**	0.05	0.02	−0.01	0.04	−0.04	0.01	−0.02	−0.05
99	Smiling	SeldomLaughLoudDuringPlay	−0.01	0.04	0.00	0.00	−0.12	−0.03	**−0.63**	−0.03	0.12	0.20	−0.06	0.02	0.08	0.05	0.12
152	Smiling	SmilesAtPeopleWhoLikes	−0.10	0.00	0.12	0.07	0.01	0.05	**0.54**	−0.03	0.16	0.09	0.00	−0.01	0.02	−0.04	0.02

Item#	Scale	Item description	Anger	Low EC	Sociability	NoticeAp	Advent	QuietP	Smiling	NotUpset WPain	Approach	(Low) Activity	Irritated Mistakes	FearDark	Sooth	FearOfLoud Noise	NotUpset SadStories
165	Smiling	RarelyLaughsAloudWhenWatchingComedies	−0.04	0.03	0.01	0.01	−0.03	0.01	**−0.49**	−0.07	0.04	0.02	0.05	0.04	−0.03	−0.04	0.17
135	Smiling	DoesntGiggleOrActSilly	−0.05	−0.04	0.05	−0.02	−0.01	0.11	**−0.46**	−0.03	0.01	0.02	0.00	0.05	−0.05	−0.08	0.09
166	Approach	ExcitedWithOpensPresents	0.13	0.00	0.04	−0.03	0.06	0.01	**0.44**	−0.03	0.22	0.01	−0.06	−0.03	0.01	−0.03	−0.06
153	Activity	PlaysActivelyOutdoorsWithChildren	−0.03	−0.06	0.06	0.04	−0.01	−0.14	**0.41**	0.08	0.06	−0.02	−0.02	0.00	0.04	0.03	−0.06
43	Smiling	EnjoysFunnyStoriesDoesntLaughAtThem	0.03	0.15	−0.07	−0.03	−0.08	0.03	**−0.42**	0.03	0.06	0.16	−0.06	−0.03	0.04	−0.03	0.15
101	Discomfort	NotUpsetByCutsBruises	0.02	−0.02	−0.01	0.02	−0.04	−0.05	−0.01	**0.76**	−0.02	−0.03	−0.01	−0.01	0.06	−0.02	0.03
132	Discomfort	LikelyToCryWhenABitHurt	0.09	0.00	0.00	−0.01	−0.03	0.08	0.02	**−0.70**	0.01	0.09	0.03	0.03	−0.07	−0.04	0.06
61	Discomfort	UpsetByALitteCutBruise	0.08	0.06	0.06	−0.03	−0.03	0.07	−0.01	**−0.67**	0.04	0.10	0.00	0.03	−0.05	0.10	0.02
85	Soothability	ForgetsBumpsScapesAfterCoupleMin	0.07	−0.01	0.02	−0.06	−0.09	−0.01	0.03	**0.48**	−0.02	0.04	0.01	−0.04	0.28	−0.08	0.04
5	Discomfort	NotVeryBotheredByPain	−0.01	0.13	−0.01	0.03	0.05	−0.09	−0.13	**0.42**	0.00	0.04	−0.10	−0.06	−0.06	0.08	0.08
117	Approach	ExcitedBeforeOuting	−0.01	0.02	−0.05	0.05	0.10	0.08	0.04	−0.02	**0.69**	0.00	0.03	0.01	0.07	−0.07	0.05
96	Approach	ExcitedWhenPlanningTrips	−0.01	−0.08	−0.01	0.16	0.04	0.08	−0.03	0.02	**0.65**	0.04	0.03	−0.01	0.06	−0.12	−0.01
131	Approach	CalmBeforeOuting	0.15	−0.18	0.04	0.03	0.00	0.06	0.02	−0.05	**−0.52**	0.06	−0.13	0.00	0.01	0.00	−0.01
191	Approach	LooksFwdFamilyOutingsButNotExcited	0.08	−0.09	−0.01	−0.12	0.04	0.02	−0.12	0.02	**−0.43**	0.10	0.02	−0.01	0.06	−0.01	0.02
192	Activity	LikesToSitQuietlyandWatchPplDoThings	0.01	−0.13	−0.11	0.04	−0.03	0.04	−0.12	0.00	−0.14	**0.52**	0.04	−0.03	0.02	0.02	0.05
186	AttnFocus	AbsorbedInPictureBook	0.00	0.02	−0.03	−0.03	−0.04	−0.02	0.05	−0.03	0.09	**0.52**	−0.08	−0.03	−0.09	0.18	0.11
36	LowPL	EnjoysSittingInSunshine	−0.09	−0.06	0.03	0.03	0.06	0.10	−0.01	0.01	−0.09	**0.48**	−0.04	0.04	0.02	−0.11	−0.17
88	Activity	SitsQuitelyForLongPeriods	0.07	−0.07	−0.04	−0.05	−0.01	−0.02	−0.19	0.04	−0.01	**0.47**	0.07	−0.06	0.06	0.01	−0.05
102	Activity	PrefersQuietActivVsGames	0.00	−0.05	−0.07	−0.01	−0.04	0.22	−0.19	−0.02	−0.11	**0.44**	−0.02	−0.01	0.01	0.02	−0.02
41	Activity	SitsQuietlyOutside	0.02	0.09	−0.03	0.02	0.08	0.12	−0.23	−0.02	−0.04	**0.40**	−0.02	−0.05	0.10	−0.10	−0.09
19	Anger	RarelyIrritatedWhenMakesMistake	−0.05	0.12	−0.02	−0.03	0.12	0.12	−0.01	0.13	−0.07	0.03	**−0.43**	0.08	0.02	−0.06	0.05
173	Anger	EasilyIrritatedWhenTroubleWithTask	0.26	0.20	0.02	0.01	−0.04	0.00	0.01	−0.11	−0.01	−0.04	**0.42**	−0.01	0.01	0.03	0.08
130	Fear	AfraidOfTheDark	0.01	−0.02	−0.01	0.01	−0.02	−0.01	−0.02	0.02	0.00	0.00	0.01	**0.87**	0.06	−0.03	0.02
70	Fear	NotAfraidOfDark	−0.03	0.04	−0.04	−0.05	0.02	0.01	0.02	0.04	0.02	−0.01	0.06	**−0.77**	0.04	0.01	−0.03
134	Soothability	EasyToSoothe	−0.22	0.00	0.08	0.03	0.02	−0.01	0.09	0.12	−0.01	0.10	−0.04	−0.01	**0.56**	0.10	−0.03
150	Soothability	DifficultToSootheWhenUpset	0.25	−0.01	−0.05	0.01	−0.03	−0.04	0.00	−0.18	−0.03	0.02	0.02	−0.04	**−0.55**	−0.01	0.06
118	Soothability	CheersQuicklyIfUpset	0.01	−0.02	0.12	0.03	−0.05	−0.01	0.03	0.14	0.16	0.09	−0.12	−0.07	**0.46**	0.02	−0.01
92	Soothability	ChangesFeelingsFast	0.00	0.09	0.09	−0.02	−0.02	0.02	0.08	0.03	0.02	0.09	0.01	0.06	**0.45**	0.00	0.08
178	Discomfort	BotheredByLoudSounds	−0.04	0.08	0.01	0.06	−0.08	0.16	−0.03	−0.04	−0.04	0.00	0.03	0.10	−0.05	**0.52**	0.01

Item#	Scale	Item description	Anger	Low EC	Sociability	NoticeAp	Advent	QuietP	Smiling	NotUpset WPain	Approach	(Low) Activity	Irritated Mistakes	FearDark	Sooth	FearOfLoud Noise	NotUpset SadStories
50	Fear	AfraidOfLoudNoises	−0.06	0.13	−0.04	−0.01	−0.18	0.18	0.02	−0.03	−0.02	−0.02	−0.03	0.18	−0.10	**0.42**	−0.05
112	Sadness	RarelyUpsetWhenWatchingSadTV	0.16	0.10	−0.02	−0.09	−0.01	0.00	−0.07	0.03	−0.12	−0.06	−0.07	0.02	0.07	−0.04	**0.47**
109	Sadness	RarelyCriesWhenHearsSadStory	0.07	0.01	−0.02	−0.06	−0.02	0.00	−0.02	0.02	−0.02	−0.09	−0.02	−0.03	0.03	0.06	**0.45**

Note. Primary loadings of ≥40 are bolded; secondary loadings of ≥.30 are bolded and italicized; two factors had no loadings of ≥ .40 and were excluded from subsequent analyses; Anger = Anger/Frustration; LowEC = low effortful control; NoticeAp = Notices Appearances; Advent = Adventurous; QuietP = Quiet Play; Smiling= Smiling/Laughter; NotUpsetWithPain = Not upset by physical pain and bruises; Approach = Approach/Positive Anticipation; (Low) Activity = low Activity Level; IrritatedMistakes = Irritated by mistakes; FearDark = Fear of darkness; Soothability = Soothability/Falling Reactivity; FearofLoudNoises = Fear of loud noises; NotUpsetSadStories = Not upset by sad stories

Table 5

Higher-Order Exploratory Factor Analyses of the CBQ Lower-Order Scales Extracted at Age 3

Four-Factor Solution					*Five-Factor Solution*					
Scales	**Factor1**	**Factor2**	**Factor3**	**Factor4**	**Scales**	**Factor1**	**Factor2**	**Factor3**	**Factor4**	**Factor5**
HighPL	**0.63**	−0.06	0.02	−0.02	HighPL	**0.58**	−0.09	0.00	0.03	0.01
(Low) Shy	0.15	0.14	***0.39***	0.09	(Low) Shy	0.16	0.17	−0.04	***0.34***	0.14
Impulsivity	**0.61**	**0.41**	−0.03	0.05	Impulsivity	**0.75**	0.02	***0.38***	−0.02	0.01
NoticeAp	−0.02	−0.28	−0.05	**0.37**	NoticeAp	−0.04	−0.18	−0.11	−0.06	***0.36***
(Low)AttnFocus	−0.04	**0.66**	0.03	−0.12	(Low) AttnFoc	−0.08	**0.77**	0.02	−0.03	−0.03
Ang/Sad	−0.01	***0.37***	***−0.37***	0.23	Ang/Sad	0.02	0.06	***0.39***	−0.30	0.17
AngAbtBed	−0.06	***0.38***	−0.17	0.05	AngAbtBed	−0.08	−0.01	**0.59**	0.02	−0.01
(Low) Activity	−0.22	**−0.46**	−0.19	−0.01	(Low) Activity	−0.26	**−0.43**	−0.03	−0.10	−0.07
Smiling	0.18	−0.02	***0.30***	**0.47**	Smiling	0.21	−0.03	0.01	0.25	**0.46**
NotUpsetWPain	0.23	0.03	**0.40**	***−0.30***	NotUpsetWPain	0.26	0.05	−0.08	***0.36***	−0.26
FearDark	−0.23	0.17	−0.06	0.16	FearDark	−0.23	−0.01	0.30	0.04	0.11
InhibCn/AttnShift	−0.02	**−0.69**	0.16	0.08	InhibCn/AttnShift	−0.04	***−0.37***	**−0.40**	0.12	0.08
Approach	0.05	0.15	0.05	**0.51**	Approach	0.04	0.18	0.00	−0.01	**0.57**
Soothability	−0.11	−0.05	**0.84**	0.05	Soothability	−0.06	0.01	−0.05	**0.81**	0.06
FearOfLoudNoise	0.01	0.03	**−0.62**	0.07	FearOfLoudNoise	−0.02	0.09	−0.09	**−0.68**	0.08

Note. Primary loadings of ≥.40 are bolded; loadings of ≥30 are bolded and italicized; HighPL = High Intensity Pleasure, LowShy = low Shyness, Imp = Impulsivity; NoticeAp = Notices Appearances; LowAttnFoc = low Attentional Focusing; Ang/Sad = Anger and Sadness; AngAbtBed = Anger about going to bed; LowActiv = low Activity Level; Smiling = Smiling/Laughter; NotUpsetWithPain = Not upset by physical pain and bruises; InhibCn/AttnShift = Inhibitory Control/Attentional Shifting; Approach = Approach/Positive Anticipation; Soothability = Soothability/Falling Reactivity; FearDark = Fear of darkness; FearofLoudNoises = Fear of loud noises; in the four-factor solution, correlations between Factor 1 and Factors 2, 3, and 4 were .34, −.24, and .02 respectively, correlations between Factor 2 and Factors 3 and 4 were .05 and −.28 respectively, and the correlation between Factor 3 and 4 was −.26; in the five-factor solution, Factor 1 correlated with Factors 2, 3, 4, and 5 at .32, .02, .38 and .25 respectively; Factor 2 correlated with Factors 3, 4, and 5 at .21, .14, and .29 respectively; Factor 3 correlated with Factors 4 and 5 at −.31 and −.07 respectively, and Factor 4 correlated with Factor 5 at −.01.

Table 6

Higher-Order Exploratory Factor Analysis of the CBQ Lower-Order Scales Extracted at Age 5/6

Scales	Factor1	Factor2	Factor3	Factor4
Anger	**0.68**	−0.04	−0.01	−0.17
(Low) EC	**0.74**	0.05	−***0.33***	0.02
Sociability	0.15	0.24	0.05	***0.35***
NoticeAp	−0.09	0.00	**0.56**	0.04
Advent	−0.03	**0.67**	0.11	−0.01
QuietP	−0.23	−**0.69**	0.01	0.03
Smiling	0.00	0.27	**0.46**	0.20
NotUpsetWPain	−0.15	0.25	−0.29	0.28
Approach	0.26	0.17	***0.39***	0.03
(Low) Activity	−***0.31***	−0.27	0.09	−0.04
IrritatedMistakes	**0.46**	−0.06	0.14	−0.17
FearDark	0.21	−0.24	0.08	−0.04
Soothability	0.02	−0.22	0.05	**0.93**
FearOfLoudNoise	0.16	−0.03	0.11	−**0.64**
NotUpsetSadStories	0.11	0.01	−***0.36***	0.01

Note. Primary loadings ≥40 are bolded; loadings ≥30 are bolded and italicized; Anger = Anger/Frustration; LowEC = low effortful control; NoticeAp = Notices Appearances; Advent = Adventurous; QuietP = Quiet Play; Smiling= Smiling/Laughter; NotUpsetWithPain = Not upset by physical pain and bruises; Approach = Approach/Positive Anticipation; (Low) Activity = low Activity Level; IrritatedMistakes = Irritated by mistakes; FearDark = Fear of darkness; Soothability = Soothability/Falling Reactivity; FearofLoudNoises = Fear of loud noises; NotUpsetSadStories = Not upset by sad stories; Factor 1 correlated with Factors 2, 3, and 4 at −.13, .26, and −.09 respectively; Factor 2 correlated with Factors 3 and 4 at .03 and −.22 respectively, and Factor 3 correlated with Factor 4 at .17.