


Measuring PROMIS[®] Well-Being in Early Childhood

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Abstract

Objective Expand the current Patient-Reported Outcome Measurement Information System (PROMIS[®]) well-being measures to early childhood (1–5 years) using best practices from PROMIS and developmental science. **Methods** Qualitative methods included expert input, literature and measure review, and parent interviews to confirm measure frameworks, item understandability, and developmental appropriateness. Quantitative methods included two waves of field testing and item response theory (IRT)-based psychometric evaluation of reliability and validity, as well as IRT centering and item calibration. Correlational analyses with other PROMIS Early Childhood (EC) Parent Report measures and known-group differences analyses by health status were conducted to evaluate construct validity. All measures were normed to the general U.S. population. **Results** Qualitative results suggested three primary early childhood well-being domains: *Positive Affect*, *Engagement*, and *Self-Regulation*. Quantitative results revealed a unidimensional factor structure for *Positive Affect* and multidimensional factor structures for *Engagement* and *Self-Regulation*, both of which had two factors accounting for >10% of modeled variance reflecting unique unidimensional domains. This resulted in five final PROMIS EC well-being measures: *Positive Affect*, *Engagement—Curiosity*, *Engagement—Persistence*, *Self-Regulation—Flexibility*, and *Self-Regulation—Frustration Tolerance*. Correlations and known-groups differences analyses showed robust construct validity across a range of chronic health conditions. **Conclusions** The new PROMIS EC Parent Report well-being measures offer clinicians and researchers a brief, efficient, and precise way to evaluate young children’s well-being. All five measures include only positively valenced item content, which pushes the field to evaluate the presence of children’s positive assets rather than the absence of problems.

Key words: health promotion and prevention; infancy and early childhood; measure validation; pre-school children; psychosocial functioning; quality of life.

Introduction

Historically, pediatric psychology has prioritized preventing or alleviating child maladaptation and

psychopathology rather than promoting positive health and well-being (Coffey et al., 2015; Mayr & Ulich, 2009). As a result, many observational and

interventional studies emphasize the impact of minimizing negative affect, behavior, and/or cognition, rather than focusing on promoting child well-being. While early identification and treatment of health problems—as well as their bioecological risk factors—is critically important, such a model often fails to consider positive assets that are indicative of children's overall well-being. Since most children do not face chronic health problems, an exclusively negative focus risks categorizing children as “healthy” simply if they are free of impairment. Such an approach misses the broad spectrum of individual differences in children's well-being and precludes understanding of whether and how certain children function well despite adverse health or circumstances (Blackwell et al., 2019). Given that parents' primary desire is for their children to flourish above and beyond, or in the context of, negative health conditions (Coffey et al., 2016; Seligman, 2011), having information on children's well-being may provide a target for pediatric health promotion that can have a resounding impact on their current and future quality of life (QoL).

Emerging evidence from adult populations shows incremental utility of accounting for one's positive psychological health, including distinct associations of well-being with cortisol, norepinephrine, HDL cholesterol, dehydroepiandrosterone sulfate, and systolic blood pressure (Ryff et al., 2006); unique changes in neural functional connectivity in specific areas of the brain (Goldbeck et al., 2019); and non-reciprocal neural activation for positive and negative affect (Davidson, 1998; Urry et al., 2004). Such biological and neural substrates have yet to be established in pediatric populations but, given peak neuroplasticity early in life, the promotion of positive thoughts and emotions has the potential to restructure and strengthen areas in the brain that inspire positivity and enhance long-term positive psychological health (Marbina et al., 2015; Shonkoff et al., 2009). Though limited in nature, observational and longitudinal studies support this theory: positive affect in infancy and toddlerhood is distinctly associated with life satisfaction in adulthood (Coffey et al., 2015), while lack of positive affect is uniquely associated with depressive symptoms in childhood (Hayden et al., 2006).

Although the importance of well-being across the lifespan is well-established, there lacks a cohesive definition and consensus on how best to measure the construct, particularly in early childhood (Conti & Heckman, 2014; Dodge et al., 2012; Jones et al., 2016; Lippman et al., 2011; Nigg, 2017). Among older children and adults, well-being is often characterized by hedonic (e.g., happiness; life satisfaction) and eudemonic (e.g., meaning or purpose in life) components, and is considered a distinct feature of the more global construct, “quality of life” (QoL) and the

more specific health-related QoL (HRQoL; CDC, 2018; Skevington & Böhnke, 2018; WHOQoL Group, 1994, 1998; WHOQoL SRPB Group, 2006). Defined by the World Health Organization as an “individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns” (WHOQoL Group, 1994, 1998), QoL includes both positive and negative perceptions of one's life; HRQoL more specifically includes an individual's perceptions of physical, mental, and social health functioning and impact of health status on QoL (CDC, 2018; Healthy People 2020, 2021). Alternatively, well-being emphasizes positive components of one's life where physical, mental, and social health functioning are maximized in the service of living a satisfying and productive life (CDC, 2018; Healthy People 2020, 2021). However, a developmental life course measurement approach remains absent (Coffey et al., 2015). Though scarce, measures of well-being in young children lack strong psychometric properties, comprehensive content coverage, and developmental sensitivity, and tend to be framed from a deficit perspective (i.e., “lack of” problems; Conti & Heckman, 2014; Moore et al., 2017). Additional work is thus required to develop a shared conceptualization and measurement of early childhood well-being.

The current study draws on the strengths of the Patient-Reported Outcome Measurement Information System (PROMIS[®]; Cella et al., 2007, 2010) and advances in developmental measurement science (Wakschlag et al., 2010) to operationalize early childhood well-being and associated parent-report measures for 1–5-year olds. The core aims of this study were: (a) Ensure a developmentally meaningful characterization of early childhood well-being; (b) Use PROMIS methods to create developmentally appropriate, positively framed early childhood well-being measures that conceptually align with existing PROMIS Pediatric well-being measures (i.e., *Positive Affect, Life Satisfaction, Meaning and Purpose*) and are calibrated and normed to the general U.S. population; and (c) Conduct preliminary measure validation.

Methods

See Cella et al. (this issue) and Lai et al. (this issue) for qualitative and quantitative methods, respectively, used to develop all PROMIS Early Childhood (EC) measures, including the well-being measures described here. Data are available upon request.

Concept Specification

In a half-day meeting with 17 transdisciplinary experts, we reviewed priority constructs, after which we conducted 23 semi-structured parent interviews, of

which 13 covered general well-being, engagement, and self-regulation, and 10 covered positive affect. For a description of experts, participant details, interview guides, and interview transcript coding methods, see Cella et al. (this issue) and associated [supplementary materials](#).

Draft Item Pool Development

We conducted a targeted review of developmental frameworks and measures of positive affect, engagement, and self-regulation for children under 8 years. We expanded the search beyond developmental sciences to the educational field as engagement and self-regulation are also considered components of early school readiness (Williams et al., 2019). In addition to the using the domain names as primary keywords, we used domain facets (e.g., engagement: interest, curiosity; self-regulation: frustration tolerance, adaptability) and related constructs found in the literature (e.g., “approaches to learning” [Moore et al., 2017]; “social-emotional” [Jones et al., 2016]; “self-control” [Moffitt et al., 2011]) as keywords. We also received measure suggestions from content experts. We used the PROMIS binning and winnowing method to first sort item and framework concepts into the three well-being domains and then, within domains, sort them into specific facets (DeWalt et al., 2007). We transformed these concepts into questionnaire items aligned to PROMIS standards for item text (e.g., “My child...”), stem (“In the past 7 days...”), and response options (*Never* to *Always*; PROMIS Cooperative Group, 2013).

All draft items underwent translatability review to ensure wording could appropriately be translated into Spanish (Devine et al., 2018), followed by cognitive interviews with at least five parents per item. Per PROMIS standards (PROMIS Cooperative Group, 2013), each item was reviewed by at least two parents who identified as Black, Indigenous, and other People of Color and one parent with less than a 12th grade education. See Cella et al. (this issue) for participant details. All final items underwent a Lexile reading-level analysis (Lennon & Burdick, 2004) and were retained if they were at or below a 6th grade reading level per PROMIS standards (PROMIS Cooperative Group, 2013).

Item Bank Development and Psychometric Evaluation

We conducted two waves of field testing to further refine the early childhood well-being instruments. In wave 1, parents ($N = 700$) completed “Form B” with all items for the three initial item pools: *Positive Affect* ($N = 18$), *Engagement* ($N = 12$), and *Self-Regulation* ($N = 13$). Wave 2 participants ($N = 1,057$) completed a reduced item set ($N = 31$) based on wave

1 psychometrics. All item pools used the same item context (“In the past 7 days...”) and a 5-point Likert scale from *Never* (1) to *Always* (5). See Lai et al. (this issue) for participant demographic information.

We evaluated item pool unidimensionality following established measure development standards (Cella et al., 2007, 2010; PROMIS Cooperative Group, 2013), employing classical test theory; exploratory factor analyses (EFA); categorical confirmatory factor analyses (CCFA); item response theory (IRT) modeling/item misfit (item fit test ratio of chi-squared to degrees of freedom >3.0) using the graded response model (GRM; Samejima, 1997); and differential item functioning (DIF) by child age (1–2 vs. 3–5 years) and sex (male vs. female). For item banks (i.e., measures with ≥ 10 items), we identified short forms (SF) for use in wave 2 by selecting a representative set of clinically relevant items while optimizing reliability.

Centering and Calibration

Using the combined wave 1 and wave 2 samples, we conducted IRT centering and item calibration in a two-step process. First, we conducted a multi-group calibration analysis using wave 2 item response data as our centering or normative sample. Second, using the wave 2 items as anchors, we calibrated the wave 1-only items to ensure that all final measure items were on the wave 2-based metric (Choi et al., 2012). We then conducted reliability analyses using the wave 2 sample, first estimating Cronbach’s alpha followed by two IRT-based reliability estimates: marginal reliability and median SE-based reliability. For item banks >8 items, we simulated computerized adaptive testing (CAT) administration and evaluated the mean and median number of items administered and the Pearson r correlation between CAT score and full bank score (see Lai et al., this issue, for CAT parameters).

Across-Domain Associations and Known-Groups Validity

We examined Pearson’s r and Spearman’s ρ correlations, as appropriate per measure score distribution, between well-being domains and other PROMIS EC domains using standard criteria to assess small (0.2), moderate (0.5), and large (0.8) magnitudes of association (Cohen, 1988). Based on relevant literature, we hypothesized the following: (a) moderate positive correlations with PROMIS EC *Global Health* and *Social Relationships* (Bethell et al., 2021, 2022; Garner & Yogman, 2021; National Research Council and Institute of Medicine, 2004); moderate negative correlations with PROMIS EC measures of emotional distress (Naragon & Watson, 2009; Ryff et al., 2006); small positive correlations with PROMIS EC *Physical Activity* (Zahl et al., 2017); and small negative

correlations with PROMIS EC *Sleep Problems* (Smaldone et al., 2007; Williamson et al., 2020). We assessed known-groups validity as follows: (a) Better versus worse general health (PROMIS EC *Global Health* T-scores (< 45 vs. ≥ 45); (b) Parent-reported emotional/behavioral/developmental condition (EBD; e.g., anxiety, Attention Deficit/Hyperactivity Disorder, Intellectual Disability) versus not; and (c) Parent-reported physical or EBD condition (“any condition”) versus not. We hypothesized (a) children with better general health would have higher well-being scores on all five measures (Blackwell et al., 2019; Moffitt et al., 2011); and (b) children with EBD and (c) children with any chronic condition would have similar or slightly lower well-being scores, given mixed findings in the existing literature (e.g., Blackwell et al., 2019 found no differences in life satisfaction for 5–9-year-old children with vs. without chronic conditions, whereas Bethell et al., 2021 found 3–17-year-old children with more medical health risks were less likely to have well-being). We investigated group score differences using parametric or non-parametric one-way analysis of variance, as appropriate per measure score distribution. We used η^2 as our effect size measure with the following interpretations: “small” = 0.01–0.05; “medium” = 0.06–0.14; “large” = >0.14 (Cohen, 1988).

Results

Concept Specification

Authors conducted an initial review of the PROMIS Pediatric well-being measures and determined *Positive Affect* was a salient facet of young children’s positive functioning and agreed it is not only measurable in young infants but also foundational to young children’s early expressions of interest, engagement, and social connections; the other two pediatric domains—*Life Satisfaction* and *Meaning and Purpose*—were deemed too cognitively complex for young children. Young children lack the necessary cognitive sophistication to conceptualize these constructs in the same way that adolescents and adults do. However, young children are capable of experiencing well-being in multiple ways, such as displaying positive emotions (i.e., positive affect) that are foundational for later expressions of life satisfaction and attempting to make sense of their world through play and exploration that reflect early meaning-making. Thus, while directly adapting the PROMIS Pediatric *Life Satisfaction* and *Meaning and Purpose* domains was deemed developmentally inappropriate, early behavioral manifestations of related constructs were proposed as new potential domains for early childhood.

Based on reviews of positive psychology theories (Coffey, 2018; Marbina et al., 2015; Ryan & Deci,

2002), previously identified priority constructs for evaluating well-being in young children (Moore et al., 2017), and longitudinal studies examining early antecedents of adult life satisfaction and meaning and purpose (Caspi et al., 1996; Coffey et al., 2015; Moffitt et al., 2011), we proposed two domains in addition to positive affect for outside experts to review: (a) Engagement (e.g., interest and curiosity, exploration, persistence); and (b) Self-Regulation (e.g., ability to control feelings and behaviors in the context of environmental demands and stimuli). We also sought expert and parent input on the more global concept of well-being to clarify whether they believed it differed from general health and QoL.

Overall Well-Being

Experts approached discussions of well-being from the perspective that it is distinct from “health” and “quality of life” but agreed that the field lacked consensus on how to define it, particularly in early childhood. They also questioned whether parents of young children would view well-being as synonymous with “being healthy.”

When parents ($N = 13$) were asked to define “well-being” for their children, they provided a range of answers. Half ($N = 6$) felt that general health was highly related to well-being, with several describing well-being as an umbrella term under which “health” resides, while others said “health” was the overarching construct and well-being was a component of health. Alternatively, the other half of parents ($N = 6$) said well-being was distinct from health. Parents described well-being as having a more positive connotation, and one parent noted, “I can have just general health and still not be getting the best out of life. And folks may be sick and still living their life to the fullest,” suggesting illness and well-being are not opposites. One parent said, “Health for a child would be their well-being” but then elaborated: “They’re very close, but well-being is, to me, more of an all encompassed, a broader term about happiness and feeling well off...health has a slightly more medical connotation.” Despite their differences, parents highlighted the traditional components of hedonic and eudemonic well-being in their global definitions of the construct. They emphasized happiness and life satisfaction, with one parent summarizing, “Well-being is reflective of the general day to day how happy are they, how are they emotionally, mentally, physically. Well-being is their ability to enjoy day-to-day life.”

Positive Affect

Parents ($N = 10$) highlighted the domain facets of *happiness* and *contentment* when describing children’s positive mood. Behavioral descriptors included “happy,” “content,” “smiling,” “laughing,” “giggly,”

“cheerful,” “bubbly,” “jubilant,” and “jovial.” Such words also reflected existing PROMIS Pediatric items for these facets (e.g., “My child smiled a lot;” “My child felt cheerful”). Nearly all parents ($N=8$) discussed the facet of *excited* as a component of positive mood, including having lots of energy that manifested in behaviors such as being more talkative, dancing and singing, being “playful,” engaging in rough-and-tumble play, and being more upbeat. They ($N=7$) all described the facet of *love* as a component of positive mood, describing their children as “the sweetest kid,” “giving hugs and kisses,” “cuddly,” and saying, “I love you.”

Engagement

Experts unanimously agreed with the importance of engagement as a key component of young children’s well-being. They described components such as persistence, motivation, attention, and problem-solving and noted the importance of play and exploration as an indicator of engagement. Parents ($N=13$) similarly highlighted two primary facets: *curiosity* and *persistence*. They described *curiosity* as approaching activities with energy and excitement, actively exploring the environment through difference senses, and creativity. Parents discussed *persistence* as having a positive attitude toward challenges, engaging in flexible problem solving by trying different ways to overcome a challenge, and sustaining attention on an activity. They also noted variability in the level of support their children required to persist, with younger children requiring more assistance or reminders to stay with a challenging activity. Additionally, several parents noted the theme of pride and confidence. They described both the effect of confidence on their children’s ability and desire to persist with an activity as well as how children exhibited pride persisting with and accomplishing challenging tasks.

Self-Regulation

Experts highlighted self-regulation as a foundational component of young children’s well-being. They emphasized focusing on the effectiveness of coping and adaptability, such as how easily a child can be soothed, “bounce back” from disappointment, and use problem-solving strategies to achieve an outcome. While experts discussed how self-regulation in the early years is also about co-regulation with the primary caregivers, such as how well the child and caregiver are responding to each other and giving/getting help, they agreed this facet could be included as part of the social health domain. Most parents (12 of 13) described three primary facets of self-regulation: *frustration tolerance*, *coping*, and *flexibility*. For *frustration tolerance*, parents focused on the emotional and behavioral expressions of frustration (e.g.,

“meltdowns”), using verbs such as cried, stomped, getting mad/angry, throwing tantrums, and not listening; only two parents reported that their children are “not easily frustrated.” Parents also described how their children *coped* with such frustrations, with most ($N=12$) focused on the specific strategies (e.g., seeking help from caregivers, distancing from the situation, using redirection or distraction). Twelve parents also expressed how well their child *were flexible* to changing and frustrating situations, often using positive keywords and phrases such as “flexible” and “easygoing.”

Draft Item Pool Development

Based on expert input, parent concept elicitation interviews, and our review of PROMIS Pediatric well-being domains and measures found in the literature, we developed three PROMIS EC well-being domain frameworks: (a) *Engagement*, comprised of curiosity (e.g., showing interest in learning new things, trying new activities, exploring one’s environment) and persistence (e.g., remaining engaged in activities, following through, having a sense of purpose through accomplishments); (b) *Self-Regulation*, with two facets of flexibility (e.g., adapting to changes and setbacks) and frustration tolerance (e.g., managing feelings and behaviors, coping); and (c) *Positive Affect*, which includes the facets of happiness (being happy, joyful, smiling and laughing), contentment (being in a good mood, positive), excitement (being enthusiastic, playful), and pride (having pride, confidence). While parents noted love as a core component of *Positive Affect*, their examples aligned more with the *Social Relationships* domain (see Blackwell et al., this issue).

In addition to the PROMIS Pediatric *Positive Affect* measure, we identified 34 non-PROMIS measures (total $N=35$ measures; see [Supplementary Material A](#) for measure list). Most measures ($N=25$ of 35) covered some or all the 1–5-year age range. Additionally, we reviewed two detailed frameworks—the Head Start Early Learning Outcomes Framework ([United States Office of Head Start, 2015](#)) and the PBS Child Development Tracker ([PBS, 2021](#))—that include developmental progressions related to well-being facets identified in the literature and by experts and parents.

Across the 35 measures and two frameworks, we identified 650 item concepts that mapped to the early childhood well-being domain facets. Incorporating language from parent concept elicitation interviews and drawing on existing PROMIS items when relevant, we translated these item concepts into 67 items that then underwent cognitive testing with at least five parents of 1–5-year olds. Of the 67 items included in cognitive interviews, 38 were retained without revision; 5 were revised, retested, and retained; and 24

were removed. Specifically, of the 20 original *Engagement* items, 10 were retained, 1 was revised and retained, 2 items were merged to avoid age-specific items (“My child shows pleasure in accomplishments, such as clapping and smiling” and “My child takes pride in his/her accomplishments” became: “My child showed pleasure or pride in his/her accomplishments”), and 7 items were dropped. For *Self-Regulation*, 10 of the original 17 items were retained, 2 required minor revisions, 1 item was split into two items and retested (“My child was good at managing his/her behaviors and emotions” became: “My child was good at managing his/her behaviors” and “My child was good at controlling his/her emotions”), and 5 items were dropped. For *Positive Affect*, of the 30 original items, 18 were retained and 12 were dropped. Reasons for removal included age-inappropriateness, overlap with other items, lack of comprehensibility, and misinterpretation of items, such that they no longer represented the core domain (e.g., for *Positive Affect*, parents’ interpretations of “My child was active” reflected physical activity more so than positive affect). All final items were at or below a 2nd/3rd grade reading level and were thus retained. See [Supplementary Materials B–D](#) for a description of how each item within a domain was revised from its original wording to final wording.

Item Bank Development and Psychometric Evaluation

In the wave 1 data on *Engagement*, *Self-Regulation*, and *Positive Affect* items, no items were flagged for unused response categories. No measure item had an item-rest score correlation (item-to-scale internal validity) below criterion ($r \geq 0.4$); all items were adequately related to the measure construct of interest. EFA eigenvalue 1–2 ratios were 4.66, 4.63, and 8.32 for *Engagement*, *Self-Regulation*, and *Positive Affect*, respectively (criterion: >4.0). Those ratio values were supportive of unidimensionality. Similarly, the percent of variance accounted for by eigenvalue 1 was 56.20, 57.42, and 64.37 for *Engagement*, *Self-Regulation*, and *Positive Affect*, respectively (criterion for supporting unidimensionality: $>40\%$).

In single-factor CCFA models using wave 1 data, we determined that factor loadings (item-to-construct internal validity) for *Engagement* and *Self-Regulation* items all attained the loading ≥ 0.50 criterion; One *Positive Affect* item was excluded for not meeting criterion. Two additional *Positive Affect* items were excluded after content experts did not consider them core to the domain for early childhood. No model residual correlations for *Engagement*, *Self-Regulation*, or *Positive Affect* were of a magnitude to suggest item local dependence ($r > 0.20$). However, we identified noteworthy correlated error ($MI \geq 100$), suggestive of

item local dependence, for two *Positive Affect* items pairs and two *Self-Regulation* item pairs. We excluded one item from each of the identified item pairs. See [Table I](#) for CCFA model fit statistics. For *Engagement* and *Self-Regulation*, overall model fit did not meet criteria. We reviewed EFA findings and observed that each item set had a secondary factor accounting for $>10\%$ of modeled variance. Subsequent item content review and the two-factor EFA factor loadings for each item set indicated that *Engagement* was better modeled as *Curiosity* (six items) and *Persistence* (six items), and *Self-Regulation* better modeled as *Flexibility* (five items) and *Frustration Tolerance* (six items). The new models each exhibited excellent model fit (see [Table I](#)).

Positive Affect had excellent fit characteristics, with the exception of $RMSEA \geq 0.10$. We conducted a categorical bi-factor analysis (CBFA) to diagnose the possible impact of multi-dimensionality on model fit. The analyzed item set was essentially unidimensional (general factor omega-H = 0.85), and the general factor had 82% of reliable variance attributable to it, supporting the use of a total *Positive Affect* score. Combined evidence from CCFA and CBFA modeling thus established each candidate well-being item set as essentially unidimensional.

We fit item responses to the GRM, and no item misfit was identified in any item set. We evaluated all item sets for DIF, investigating age (3–5- vs. 1–2-year olds) and sex (female vs. male) factors. In Stage 1, no items were flagged for DIF (Nagelkerke *pseudo-R*² value ≥ 0.20). Therefore, no Stage 2 analyses were required. See [Table II](#) for descriptive statistics of final item sets and [Figure 1](#) for *T*-score distributions.

Centering and Calibration

We used wave 2 data as the representative sample for PROMIS EC measure centering. First, we successfully conducted multi-group item calibration analyses for the *Curiosity*, *Persistence*, *Flexibility*, and *Frustration Tolerance* measures, as well as the *Positive Affect* eight-item SF. Next, we created a measurement link to the five uncalibrated *Positive Affect* items (administered only to wave 1 participants), calibrated those

Table I. CCFA Model Fit Statistics

Measure	CFI	TLI	RMSEA	# items
Positive affect	0.98	.97	.11	13
Engagement	0.91	.89	.16	12
<i>Curiosity</i>	1	.99	.07	6
<i>Persistence</i>	0.99	.98	.09	6
Self-regulation	0.91	.88	.19	11
<i>Flexibility</i>	1	1	.06	5
<i>Frustration Tolerance</i>	0.99	.99	.10	6

Note. CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root mean square error of approximation.

Table II. Item Statistics for PROMIS Early Childhood Parent Report Well-being Measures

Domain	Wave 1 (N = 700)				Wave 2 (N = 1,057)			
	Mean	SD	% floor (never)	% ceiling (always)	Mean	SD	% floor (never)	% ceiling (always)
<i>Engagement—Curiosity</i>								
My child showed interest and curiosity in learning new things.	4.33	0.87	1.29	53.14	4.37	0.74	0.38	50.05
My child was eager to try new things.	4.11	0.96	1.86	42.43	4.13	0.85	0.57	39.07
My child actively explored the world around him/her.	4.30	0.89	1.71	51.86	4.38	0.74	0.28	51.18
My child participated in new activities even if they seemed challenging.	3.95	0.96	2.29	32.86	4.02	0.86	0.66	32.73
My child enthusiastically tried new things outside his/her comfort zone.	3.80	1.01	2.43	28.71	3.75	0.93	1.32	24.31
My child asked “why,” “what,” and “how” questions. ^a	4.21	1.02	2.86	50.86	3.91	1.27	9.46	43.05
<i>Engagement—Persistence</i>								
My child kept working at something until he/she was finished.	3.82	0.96	1.71	27	3.57	0.87	1.89	13.15
My child didn’t give up when something was hard.	3.72	0.99	3.00	23.71	3.4	0.83	1.14	9.46
My child persisted in activities when encouraged to do so.	4.09	0.87	1.00	35.71	3.84	0.78	0.57	18.64
My child tried a different strategy to solve a problem when one solution didn’t work.	3.76	0.96	2.14	23.71	3.48	0.84	1.14	11.83
My child showed pleasure or pride in his/her accomplishments.	4.35	0.85	0.86	54.29	4.35	0.76	0.47	50.24
My child was confident in his/her abilities.	4.12	0.88	1.29	38.14	4.14	0.75	0.47	33.59
<i>Self-Regulation—Flexibility</i>								
My child made transitions easily.	3.69	0.95	2.86	19.29	3.74	0.80	0.57	15.89
My child accepted suggestions for alternative ways of doing something.	3.59	0.95	2.71	17.86	3.52	0.82	1.61	10.50
My child was flexible to change.	3.67	0.99	2.71	21.14	3.53	0.79	1.14	10.41
My child adapted well to setbacks or challenges.	3.64	0.95	2.00	19.00	3.47	0.80	1.31	9.46
My child adjusted easily to changes in routines.	3.64	0.98	2.71	19.86	3.57	0.84	1.04	13.25
<i>Self-Regulation—Frustration Tolerance</i>								
My child could wait if asked, even if he/she really wanted to do something.	3.27	1.06	5.00	13.57	3.21	0.88	2.08	8.14
My child managed frustration well.	3.39	1.02	4.14	14.57	3.14	0.79	1.89	4.73
My child stayed calm and in control when faced with a challenge.	3.43	0.96	3.00	13.00	3.24	0.76	0.95	5.30
My child found ways to distract him/herself when frustrated.	3.44	0.98	3.57	15.14	3.10	0.86	2.93	5.77
My child bounced back quickly when things didn’t go his/her way.	3.74	0.99	2.71	24.57	3.72	0.83	0.76	16.93
My child was good at managing his/her behaviors.	3.56	0.95	2.71	17.14	3.46	0.79	0.95	8.61
<i>Positive Affect</i>								
My child was happy^b	4.38	0.70	0.57	48.00	4.39	0.59	0.28	43.05
My child was joyful^b	4.33	0.75	1.00	46.00	4.33	0.59	0.19	38.79
My child smiled a lot^b	4.41	0.75	0.71	53.00	4.46	0.6	0.19	50.52
My child was playful^b	4.54	0.67	0.14	61.86	4.48	0.59	0.19	52.13
My child was carefree	4.10	0.93	2.00	39.29	4.26	0.76	0.57	42.01
My child laughed a lot	4.35	0.74	0.57	48.00	4.34	0.65	0.38	41.91
My child was in a good mood	4.21	0.71	0.43	36.00	4.19	0.59	0.09	28.19
My child was cheerful.	4.33	0.75	0.57	46.43				
My child was positive.	4.21	0.76	0.57	37.71				
My child was enthusiastic	4.31	0.81	1.29	48.57	4.38	0.62	0.00	44.75
My child was confident.	4.29	0.80	0.71	47.29				
My child was content.	4.07	0.80	1.00	30.29				
My child was proud ^a	4.10	0.85	1.14	36.29				

Note. **Bold** = 8-item short form. All instruments used the same item context (“In the past 7 days. . .”) and a 5-point Likert scale from *never* (1) to *always* (5), with item raw scores ranging from 0 to 5.

^aN = 350 parents of 3–5-year olds.

^bFour-item short form.

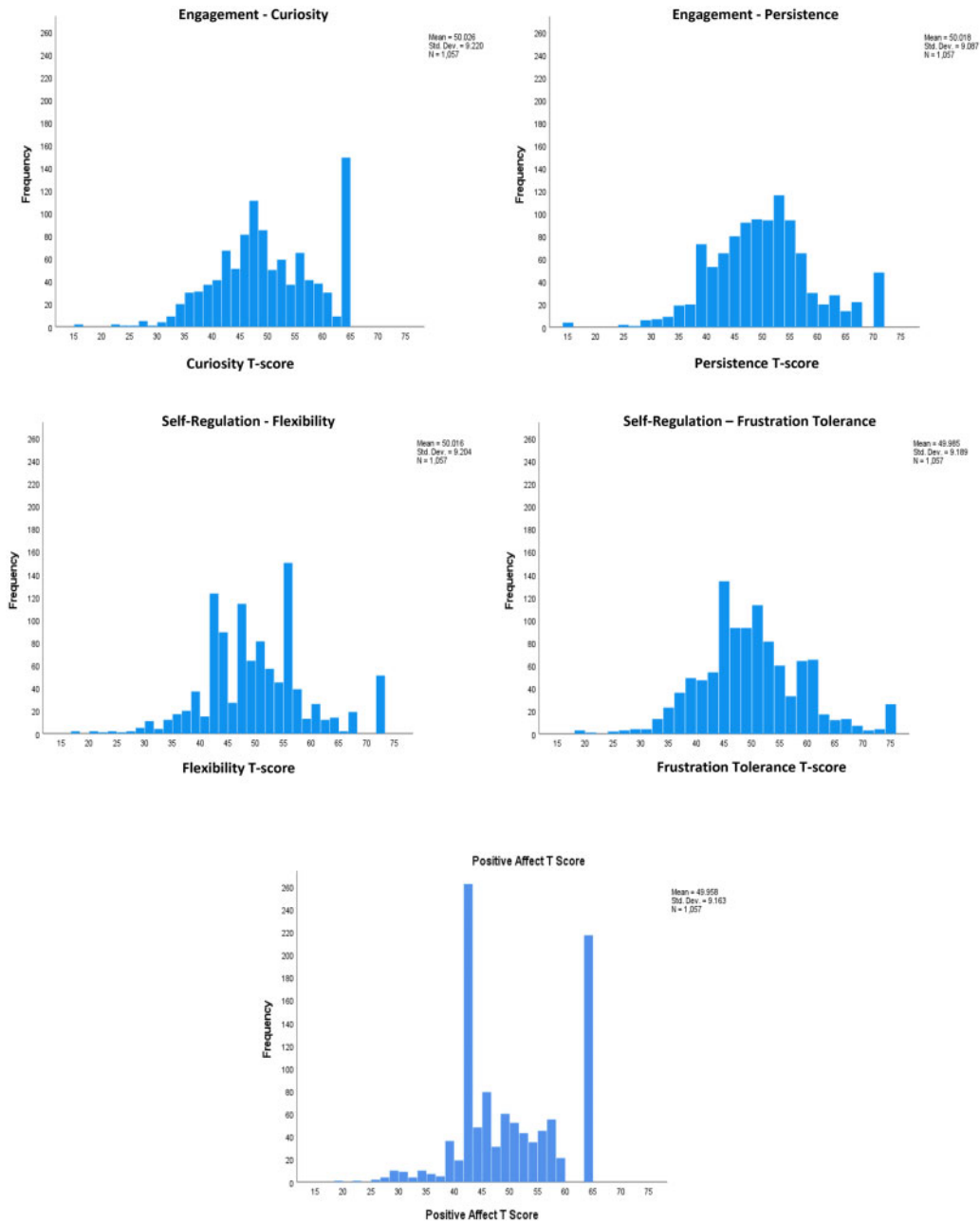


Figure 1. T-score distributions of PROMIS parent report early childhood well-being measures.

items, and thereby ensured that all final *Positive Affect* measure items were on the wave 2-based metric. Cronbach’s alphas ranged from good to excellent (0.87–0.95), as did marginal reliability (0.82–0.92) and median SE-based reliability ranged from good to excellent (0.82–0.92; see Table III and Figure 2). We identified four of the eight items from the eight-item SF that were most clinically relevant and provided the best attainable score-level reliabilities across our targeted T-score range for the four-item SF (see Table II).

For the simulated CAT administration of the 13-item *Positive Affect* measure, the mean and median number of items administered were 5.96 and 6.00, respectively; the Pearson’s *r* correlation between CAT

score and full bank score was 0.98; and the mean and median SE of CAT scores were 0.33 and 0.29, respectively. The *Positive Affect* CAT’s starting item (item with maximum information at location theta = 0) was “My child was happy.”

Across-Domain Associations and Known-Groups Validity

The associations between well-being domains were all positive and moderate in magnitude (0.37–0.63), as were associations between well-being domains and *Global Health* and *Social Relationships* (0.37–0.53). Conversely, associations with emotional distress domains (*Anxiety*, *Anger/Irritability*, *Depressive*

Table III. *Known-Groups Analyses Across PROMIS EC Well-Being Measures*

Factor	Score	Group	N	Mean	SD	p Values	η^2
Global Health	Curiosity T-score	<45	347	45.9	8.44		
		≥45	710	52.0	8.92	<.001	0.1
	Persistence T-score	<45	347	46.5	7.98		
		≥45	710	51.8	9.09	<.001	0.08
	Flexibility T-score	<45	347	46.3	8.09		
		≥45	710	51.8	9.18	<.001	0.08
	Frustration Tolerance T-score	<45	347	46.6	8.21		
		≥45	710	51.6	9.20	<.001	0.07
	Positive Affect 8-item SF T-score	<45	347	46.0	8.60		
		≥45	710	51.9	8.81	<.001	0.09
EBD condition	Curiosity T-score	No	927	50.5	9.05		
		Yes	110	46.4	9.88	<.001	0.02
	Persistence T-score	No	927	50.5	9.05		
		Yes	110	46.7	8.77	<.001	0.02
	Flexibility T-score	No	927	50.6	9.10		
		Yes	110	45.1	8.51	<.001	0.03
	Frustration Tolerance T-score	No	927	50.6	9.01		
		Yes	110	45.6	9.34	<.001	0.03
	Positive Affect 8-item SF T-score	No	927	50.5	9.00		
		Yes	110	45.9	9.43	<.001	0.02
Any condition	Curiosity T-score	No	770	50.6	9.03		
		Yes	285	48.6	9.60	<.01	0.01
	Persistence T-score	No	770	50.6	9.00		
		Yes	285	48.5	9.18	<.01	0.01
	Flexibility T-score	No	770	50.8	9.10		
		Yes	285	47.9	9.18	<.001	0.02
	Frustration Tolerance T-score	No	770	50.7	8.91		
		Yes	285	48.2	9.69	<.001	0.02
	Positive Affect 8-item SF T-score	No	770	50.6	8.92		
		Yes	285	48.2	9.63	<.001	0.01

Note. EBD = emotional/behavioral/developmental condition; PROMIS EC = PROMIS Early Childhood; η^2 = effect size, using the following interpretation guidelines: “small” effect = 0.01–0.05; “medium” effect = 0.06–0.14; “large” effect = >0.14 (Cohen, 1988). Expected range for all PROMIS measures using the PROMIS T-score metric is 10–90.

Symptoms) were moderate in magnitude (≤ 0.45) and negatively correlated. Low to moderate correlations were found for the physical health domains, with positive associations for *Physical Activity* (0.11–0.18) and negative associations for *Sleep Problems* (0.16–0.33). See Lai et al. (this issue) for full correlation matrix.

All known-groups analyses based on *Global Health* T-scores (< 45 vs. ≥ 45) were statistically significant ($p < .05$) and had medium effect sizes ($\eta^2 = 0.06$ –0.14); children with “worse” general health had lower well-being scores across all five well-being measures. All known-groups analyses based on only EBD and any condition (EBD or physical) were also statistically significant ($p < .05$) but had small effect sizes ($\eta^2 < 0.01$ –0.03). Each “condition present” group had lower well-being scores across all five of the well-being measures tested.

Discussion

These new PROMIS EC parent report well-being measures provide brief and psychometrically sound assessments of young children’s positive functioning across constructs that are deemed important to both

experts and parents. PROMIS is a widely used measurement system with a set of positive psychological health measures appropriate for individuals 5 years and older. To create comparable assessments for younger children, we drew on the developmental specification framework (Wakschlag et al., 2010) and PROMIS IRT-based methodologies (Cella et al., 2007, 2010) to construct strengths-based calibrated and normed measures of developmentally appropriate components of early childhood well-being. We took a holistic approach to evaluating young children’s well-being to accommodate the multidimensional nature of this broad construct (Marbina et al., 2015) and developed five new measures validated for parents to report on their 1–5-year-old children: *Positive Affect*, *Engagement—Curiosity*, *Engagement—Persistence*, *Self-Regulation—Flexibility*, and *Self-Regulation—Frustration Tolerance*. This suite of measures—in addition to PROMIS EC *Social Relationships* (Blackwell et al., this issue)—defines early childhood pediatric well-being as healthy social and emotional development across multiple domains. This refers to “a child’s capacity to experience, manage, and express a full range of positive and negative emotions; develop

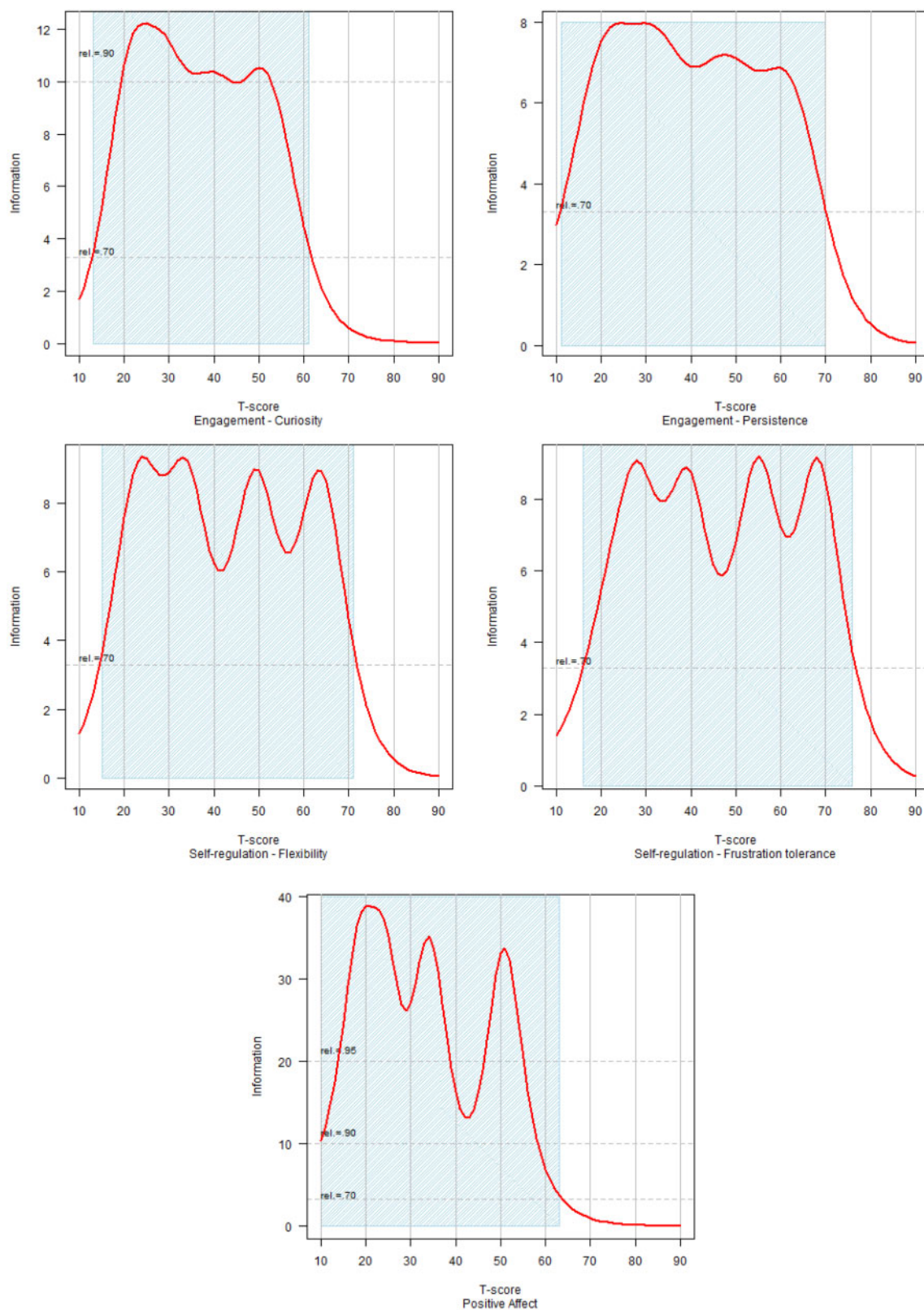


Figure 2. Test information plots for PROMIS EC well-being measures. *Note.* Dotted horizontal lines represent a degree of internal consistency reliability (i.e., 0.70, 0.90, or 0.95) typically regarded as sufficient for an accurate individual score. The shaded blue region marks the range of the scale where measurement precision is comparable to the reliability of 0.70 for each measure.

close, satisfying relationships with others, and actively explore environments and learn” (Zero to Three, 2009).

Results from correlational analyses showed moderate negative correlations with emotional distress measures, suggesting positive mental health is more than the “flip side” of negative mental health. This is consistent with the adult literature in this area, noting that the two can, and do, often co-exist (Naragon & Watson, 2009; Ryff et al., 2006). These five measures reliably and validly assess well-being in young children—a powerful shift from existing assessments. Known-groups comparisons confirmed this sentiment. While findings showed children with chronic conditions had significantly poorer well-being, the effect sizes were small, equating to half a standard deviation or less difference between those with and without chronic conditions. Such findings extend research showing 5–9-year olds with chronic illness often have similar levels of life satisfaction, as measured by the PROMIS Pediatric parent-proxy measure, as their peers without illness (Blackwell et al., 2019); studies on adolescents and adults also suggest life satisfaction and positive affect do not equate with the absence of illness (Määttä et al., 2013). The current study now provides foundational evidence for this in young children.

The expansion of the PROMIS positive psychological well-being measures to early childhood enables lifespan coherence while also addressing a gap in pediatric psychology methods. Given the dearth of research on positive psychology in early childhood (Baker et al., 2017) and particularly interventional work (Shoshani & Slone, 2017), such measures may be useful for clinical evaluation and treatment planning across populations of children with and without chronic health conditions. The *Engagement* and *Self-Regulation* measures enable dimensional measurement of well-being and afford enable measuring specific components of well-being. *Positive Affect* rounds out the suite of measures with options for 4- and 8-item short-forms and CAT administration.

Limitations and Future Directions

For a broad discussion of qualitative and quantitative methodological limitations used to develop the PROMIS EC instruments, see Cella et al. (this issue) and Lai et al. (this issue), respectively. For the well-being measures in particular, embedding them in epidemiologic and treatment studies would be informative for determining if accounting for well-being adds explanatory value for outcome heterogeneity. If so, a next step would be translation into tailored interventions based on well-being status. Such studies may also investigate whether and how early childhood well-being manifests in later well-being and what

environmental factors promote or limit its development across the lifespan. Additionally, these measures were developed to conceptually align with existing PROMIS parent-proxy well-being measures for children ages 5–17 years and were adapted to ensure developmental meaningfulness, rather than mere downward extensions. Future work on harmonizing the measurement of these concepts across early and middle childhood is needed.

The strengths of centering the measures on a sample drawn from the general U.S. population recruited via address-based probability sampling enables individual and group comparisons to the “average” 1–5-year-old U.S. child. Though this initial psychometric validation used data representative of the general U.S. population, additional work with larger subgroup sample sizes can investigate differences in well-being by socio-demographic factors. Future work can also evaluate the generalizability of these instruments to children in other countries, and international work is already ongoing in such countries as Australia, Cyprus, Greece, the Netherlands, Poland, Spain, Turkey, and the UK (De Young et al., 2021; Vasileva et al., 2021). Known-groups analyses also provide early insight into the clinical relevance of the well-being measures, but given the relatively small and mixed sample size of children with chronic conditions ($N = 285$), additional research is needed to better understand well-being in populations of young children with chronic conditions. Clinical validation studies will also provide additional insight into the robustness of the measures in specific health populations. The availability of these scales is an important advance for assessing positive features of pediatric QoL in their early forms and in enabling application of PROMIS measures across developmental periods. Their efficiency is also pragmatic for large neurodevelopmental research consortia such as ECHO and HEALthy Brain and Child Development studies where lengthy assessments and behavioral observations are not practical (Blackwell et al., 2018; Morris et al., 2020). Establishing the incremental utility of this positively valenced domain for prediction and clinical decision making and outcomes will be an important next step, along with longitudinal research that examines associations between these early childhood well-being scales and those employed at older ages.

Supplementary Data

Supplementary data can be found at: <https://academic.oup.com/jpepsy>.

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