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Subjective Well-Being (SWB) Measures for Children were Developed within the PROMIS® Project: Presentation of First Results

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Abstract

Objective—The aims of this Patient Reported Outcome Measurement Information System (PROMIS®) study are (1) to conceptualize children's subjective well-being (SWB), and (2) to produce item pools with excellent content validity for calibration and use in computerized adaptive testings (CAT).

Study Design and Setting—Children's SWB was defined through semi-structured interviews with experts, children (age 8-17 years-old), parents, and a systematic literature review to identify item concepts comprehensively covering the full spectrum of SWB. Item concepts were transformed into item expressions and evaluated for comprehensibility using cognitive interviews, reading level analysis, and translatability review.

Results—Children's SWB comprises affective (Positive Affect) and global evaluation components (Life Satisfaction). Input from experts, children, parents, and the literature indicated

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Appendix 1 / Supplemental Information. Comprehensibility Ratings and overview of item selection of the Pediatric SWB item bank. Appendix 2 / Supplemental Information. References of the authors of the instruments included in the Item Bank Development (see table 2).

that the eudaimonic dimension of SWB - i.e., a sense of meaning and purpose - could be evaluated. Item pools for Life Satisfaction (56 items), Positive Affect (53 items), and Meaning and Purpose (55 items) were produced. Small differences in comprehensibility of some items were observed between children and adolescents.

Conclusion—The SWB measures for children are the first to assess both the hedonic and eudaimonic aspects of SWB. Both children and youth seem to understand the concepts of a meaningful life, optimism, and goal orientation.

Keywords

Child; Pediatric health; Subjective Well-Being; Item Bank; Measurement; Validity

Introduction

Patient-reported outcome (PRO) measures are now commonly used in research, clinical practice, and population surveillance (1). Their growing importance is highlighted by the 2009 guidance issued by the Food and Drug Administration (FDA) on necessary criteria for using PROs to support claims for medical product labeling (2), and the US government's establishment of the Patient-Centered Outcomes Research Institute (3). Recognizing the rapidly increasing use of PROs in clinical research and the need to create a scientifically rigorous, common measurement approach for PROs, the National Institutes of Health in 2004 launched the Patient Reported Outcome Measurement Information System (PROMIS®, www.nihpromis.org) initiative. PROMIS is carried out by a network of research and coordinating centers across the US (4;5), which have developed item banks using a mixed-methods approach (6-9).

PROMIS uses a conceptual framework composed of physical, mental, and social components of self-reported health to organize measures (4-6). Pediatric item banks that have been developed include physical functioning of upper extremities (10), and mobility (10), fatigue, depression, anxiety (11), anger (12), pain interference (13), peer relationships, and an asthma impact scale (14).

Most PRO instruments focus on assessing self-reported distress, such as symptoms, functional limitations, and the negative impact of a chronic illness. Researchers and clinicians recognize the limitations of this negative orientation of health status assessment (15) and have suggested augmenting these measures with others focused on positive health assets and positive psychological functioning (16-18). Substantial attention has been devoted to subjective well-being (SWB) among adults as a multidimensional, positively oriented concept that encompasses how well life is going for a person (16-25). SWB overlaps with health-related quality of life (HRQOL) in that it is part of positive mental health (26). There has been very little attention given to the developmental origins of SWB, whether these concepts are relevant to children's life experiences, health and coping with diseases, and how best to measure SWB in pediatric populations. This lack of attention calls for a change, because studies suggest a link between pediatric SWB and health (27) and many pediatric professionals point out the need to focus on SWB in pediatric health care (28;29).

Although a few measures assess components of SWB, such as life satisfaction (30-34) and positive affect (30), there is no single, commonly used, comprehensive measurement system for assessing children's SWB. It remains unclear whether the hypothesized structure of SWB for adults comprising hedonic (states of pleasure and happiness) and eudaimonic (meaning and purpose, personal growth and goal attainment (35)) dimensions is relevant to children. It is worth noting, however, that the ability to feel positive in the face of illness, to adapt to one's life and find an overall sense of satisfaction, and to find meaning in life appear to be possible for children with chronic conditions (32;36).

The purpose of this manuscript is to present the qualitative development of the PROMIS Pediatric Subjective Well Being (SWB) item banks. This represents the initial phase in the mixed-methods approach to item bank development. Our aims were (1) to evaluate whether the conceptual structure of children's subjective well-being is similar to adult models of SWB and (2) to produce preliminary item pools with excellent content validity that are ready for item bank calibration and further validation using classical test and item response theory (IRT) methods. IRT methods have been used to advance measurement towards greater efficiency and precision, improving comparability across measures (via linking techniques) and shortening of surveys via Computerized Adaptive Test (CAT-technology (6)) to reduce response burden.

Methods

The qualitative methods described in this manuscript were designed to produce theoretically grounded and developmentally informed conceptualizations of SWB concepts that would guide the creation of content valid item pools. Our approach modified the well-established methods previously developed for PROMIS (7;37-39). The specific steps include concept specification, expert input, systematic literature review, parent/child interviews, cognitive interviews, translation review, and reading level analysis as displayed in figure 1. These are discussed in more detail below.

SWB Concept Specification

Our starting definition for SWB was derived from work by McGillivary and Mathew, who proposed that SWB “involves a multidimensional evaluation of life, including cognitive judgments of life satisfaction and affective evaluations of emotions and moods on life circumstances and experiences” (40). The cognitive evaluation of life satisfaction is the degree to which expectations for life are being met. People report high levels of life satisfaction when they think of their life positively, make favorable assessments of their past and current life, have positive appraisals of their future, and feel good about how others view their life (16). As conceptual starting points, we integrated Diener's tripartite model of SWB (16;23), Ryff's conceptualization of psychological well-being as comprising both hedonic (pleasure and happiness) and eudaimonic (personal growth, meaning and purpose) dimensions (18;20), Antonovsky's conceptualization of salutogenesis and sense of coherence (41;42), Harter's work on children's self concept (43), self determination theory (44), and positive psychology (21).

Within the PROMIS conceptual framework, SWB is categorized as a dimension of positive mental health (see www.nihpromis.org). Thus, our initial conceptual framework for SWB did not include negative affect. Hypothesized unidimensional, sub-domains of SWB included positive affect (positive emotions and mood associated with pleasure, joy, elation, contentment, bliss, pride, affection, happiness, engagement, excitement, and ecstasy) and life satisfaction (global evaluations of life overall and by domain and assessment of the conditions of one's life). This approach is consistent with psychological well-being social indicator research (45) and commonly used measures of well-being among adults (24). However, additional qualitative developmental work (described below) with SWB experts and children themselves indicated that a third sub-domain would be relevant to children: meaning and purpose in life. The final working framework, then, included the domain of SWB and three sub-domains: positive affect, life satisfaction, and meaning and purpose.

SWB Expert Interviews

We conducted semi-structured interviews with 10 experts in the measurement of SWB among children and young adults. The goals of these interviews were to assess whether the initial SWB concept specification was relevant to children, to identify gaps in concept specification, and to determine the current knowledge base regarding how SWB changes during children's development. To prepare for the interview, the 10 experts (7 US domestic and 3 foreign experts) were asked to review and critique a domain definition and subdomain conceptualization of SWB. The interviews explored the conceptualization of SWB, its theoretical and physiological-anatomic foundations, its developmental perspectives, and its potential to improve pediatric health care. We revised the SWB concept specification iteratively following each interview. A final definition of SWB, its subdomains, and conceptual facets (i.e., manifestations of the SWB unidimensional subdomain) were developed and reviewed by the experts to assure consensus. This conceptual framework of SWB guided subsequent qualitative developmental work.

Systematic Literature Review

To identify all person-reported outcome measures that assess children's SWB, we conducted a systematic literature review using an approach developed by Klem and colleagues (39). In collaboration with University of Pennsylvania biomedical librarians, we developed controlled vocabularies that operationalized (1) the SWB concepts of positive affect, life satisfaction, and meaning and purpose, (2) measurement, and (3) self-reported mode of administration. The vocabularies were applied, and modified as necessary, to Medline, CINHAL, PsycINFO®, and HaPI. Inclusion criteria were: the study described either the development or application of a self-reported SWB measure, included children age <18 years-old, and was published in English, Spanish, or German. Abstracts of identified articles were reviewed, and articles that met the inclusion criteria were retrieved. Pediatric SWB instruments were identified from the review, and authors of the instruments were contacted to obtain approval to review items.

Child/Parent Interviews

Semi-structured interviews among 20 children 8-17 years-old and parents of 5 of them were done to elicit children's experiences of SWB, specifically their feelings and thoughts about

happiness and leading a good and meaningful life. A sample of 20 was obtained because by 15 children, we had achieved concept saturation; an additional five was done to ensure no additional concepts were elicited. Interviewees were asked to describe how they understand the concept of SWB, how they perceive SWB in their lives and describe thoughts, feelings, behavior, meaning of life and goals associated to of SWB. Additionally, we sought to understand the everyday language that children and parents use to describe these feelings, mood states, and cognitions. Study investigators trained in the semi-structured interview procedure conducted interviews, which were audio-taped, and transcribed. We reviewed the interview transcriptions, listed the SWB concepts identified by participants, subjected them to thematic analysis and summarized key findings. If a concept was deemed novel and seemed relevant to the expert workgroup, the conceptualization of SWB and its sub-domains was revised. The specific words used by children and their parents to describe SWB were catalogued for future use in item pool development.

Item Classification, Selection, Reduction, and Generation

Item concepts were derived from the child and parent interviews and review of instruments obtained during the literature review. During review of SWB instruments, the relevant SWB concept was extracted; for example, if an item read “In the past 4 weeks, I was happy with my life” the concept recorded would be “happy with life.” Three experts classified item concepts into one of the three sub-domains (see table 1) and within each sub-domain into a conceptual facet. The initial subdomain-facet structure was defined based on expert interviews, refined by the child interviews, and further modified during the item classification process. The process of systematically grouping item concepts into facets (“binning”) allows investigators to observe conceptual coverage and to decrease the larger item concept pool by “winnowing” redundancies (38).

Differences in grouping were resolved through a consensus process to produce a single item concept classification—i.e., assignment to a single subdomain-facet. Interrater agreement was calculated using the kappa statistic. If an item concept did not fit into one of the pre-specified facet categories, it was marked as “other.” Items that were determined to be out of scope (not an attribute of any of the three sub-domains) were deleted from the item concept map. Conceptually similar “other” items were grouped to create novel facets, assuming that they were consistent with the scope of the SWB domain definition. Once agreement was achieved on item concept classification, workgroup members removed redundant SWB concepts and determined the extent to which they measured the full range of facet expression. Additional item concepts were added to fill in gaps in conceptual coverage.

The SWB concepts from the items identified from the literature review were used as a basis for writing a set of SWB items. Each item expression had an item context (such as the recall period), item stem, and response options. Items were written to adhere to PROMIS technical specifications: (1) items must be meaningful in isolation of all other items to support inclusion in short forms and computerized adaptive testing; (2) items within an item bank must have similar context statements (e.g. “In the past 7 days,”); (3) items should be as concise and simply worded as possible avoiding idiomatic phrases and jargon; (4) items should be worded to use one of the response options previously used in PROMIS; and, (5)

items cannot be multi-barreled (e.g. contain more than one concept). We chose a 5-point response option format to be consistent with other PROMIS pediatric measures and because extensive prior research has shown that children as young as age 6 years-old can validly and reliability respond to 5 response options and prefer that format as well (33;38;46;47).

Cognitive Interviews

Cognitive interviews can identify problems with item comprehension, recall, and other cognitive processes that can be remediated through question rewording, reordering, or more extensive instrument revisions (48;49). We carried out cognitive interviews with 37 children 8-17 years to determine the readability, comprehension, and appropriateness of items, their response options, and recall periods. Methods adhered to PROMIS standards for conducting cognitive interviews (37;38;48). The sample size was determined based on prior cognitive interviewing studies for PROMIS pediatric measures (38;50). During the interviews, children were asked to provide open-ended feedback on each item regarding response categories, time frame, item interpretation, and overall impression of domain content and coverage. An item sampling method was applied to ensure that approximately 25 items were tested with each child. Each item was cognitively tested in 5 or more children. At a minimum this included at least two children 8-11 years of age, one adolescent 12-17 years old, two children of nonwhite race, and one child of white/Caucasian race.

The interviewers participated in a standardized training session that included general information on cognitive interview theory and procedures, as well as pediatric specific procedures carried out by a pediatric psychologist. Interviewers rated items at the time of the interview on a 3-point scale (1 = not understood, 2=potential problem, 3=clearly understood). The directions and response scales were also rated in this way. Interviews were audio-taped and transcribed. Typed field notes were made of the meaning, evaluations, and problems identified or suggestions made for improvements. The field notes were reviewed to identify ways to rewrite problematic items and to determine if some items were more appropriate for use with children of specific ages.

Reading Level Analysis

The Flesch-Kincaid method in Microsoft Word was used to determine item readability. We contrasted this method with the Lexile Analyzer, which analyzes writing samples by evaluating semantic (word frequency) and syntactic (sentence length) characteristics. The scores between the two methods were nearly perfectly correlated. The readability score from the Flesch-Kincaid method analyzed and rated text on a U.S grade-school level based on the average number of syllables per word and words per sentence (51). For example, a score of 4.0 means that a fourth grader would be expected to understand the text. Our target was to develop a SWB tool comprehensible for elementary school reading level (8 yrs and older).

Translatability Review

To ensure that PROMIS item banks are translatable, a team of four translation experts in conjunction with SWB content experts reviewed each item according to the PROMIS rating system (52). This included identifying idiomatic expressions, complex sentences, and concepts that are not easily translated into Spanish and German. This translatability review

led to the modification or deletion of items. The preliminary SWB measures are undergoing translations into Spanish and German. The procedure followed international and PROMIS standards (52-54) and are described elsewhere (manuscript in preparation).

Results

SWB Concept Specification

After iterative review and revision by the 10 content experts, child/parent interviews, item classification, and literature review, final definitions (Table 1) were produced for SWB and its three subdomains. These final versions were reviewed and approved by the PROMIS Steering Committee.

Experts indicated that very little is known about the developmental changes associated with SWB. They had no concerns about the comprehensibility of *Positive Affect* for children as young as age 8, because these are assessments of feelings and mood, and ample evidence has shown that children can provide reliable reports on these phenomena. Experts lacked consensus on whether pre-adolescent children would have the cognitive capabilities to provide evaluative judgments of life satisfaction or meaning and purpose, which require the capacity to think across long time frames, or the life experiences to compare one's life to others. Despite this uncertainty, it was suggested that we explore inclusion of the eudaimonic component of well-being (20)—meaning and purpose--in our conceptual framework and asserted that this aspect of SWB may start with a sense of having goals that one strives to achieve, feeling engaged in activities, and having a sense of accomplishment, (55-57) and evolve from childhood into adolescence.

Literature Review Results

The systematic search strategy yielded 3,995 articles, with 70% retrieved from Medline, 20% from PsycINFO, and the balance from CINAHL and HAPI. Of these, 163 articles satisfied the inclusion criteria. A total of 92 unique child-reported SWB instruments were identified. We contacted and obtain permission for review from authors for 64 tools (70%)--see Table 2 for the complete list. Four authors refused our request to review their instruments, and 24 authors could not be located. The tools yielded 1,915 item concepts relevant to pediatric SWB.

Results of the Child/Parent Interviews

Mean age of children interviewed was 12.3 years (+/-SD=2.8) and 37% were between the ages of 8 and 11 years. Of the 20 children, 37% were white and 58% had a chronic condition. Four of the five parents were mothers; one was a father. Children's responses to the interviews provided rich insight into their perspectives on what a good life is and what a meaningful life is (Table 3). Children routinely mentioned positive affective states when discussing life as good. Not only did children report that the good life comprised feeling happy, being healthy, and having fun social activities (a hedonic sense of well-being), they also considered doing well in school, being a good person, and helping others as important. Children were adept at discussing their views of what a meaningful life is, and focused on their peer relationships, family life, accomplishing goals, striving to do well, and being

remembered by others. These results informed the SWB concept specification, supported the additional inclusion of meaning and purpose as a SWB subdomain for children and adolescents that merits further evaluation, and provided language and concepts that were integrated into new item generation. Overall 13 unique item concepts were derived from the qualitative interviews. Parent interviews provided results that were consistent with those from their children.

The qualitative assessment found no differences of interview results by gender and race, although it is possible that our larger sample sizes may detect such differences.

Preliminary Item Pool Creation

A team of three content experts sorted the initial pool of 1,915 SWB item concepts into a SWB sub-domain-facet structure, using a “binning and winnowing” method as previously described (kappa=0.77). Item concepts dropped during this step had negative valence (distress, pessimism etc.), were too specific (e.g. specific goals/motivations), were too vague (general values), or were uncommonly experienced by children (job satisfaction). The resulting pools included 229 Life Satisfaction concepts, 203 Positive Affect concepts, and 69 Meaning and Purpose concepts.

The sub-domain concept maps were used to create a unique item pool of SWB items. Each item was written de novo. The translation of the concept map into item expressions resulted in 58 Positive Affect, 64 Life Satisfaction, and 57 Meaning and Purpose items. Consistent with PROMIS standards, items that ask about feelings such as Positive Affect were assigned a 7-day recall period (58). Based on experience with other measures of pediatric life satisfaction (30;46), we elected to use a 4-week recall period for the Life Satisfaction item pool. No recall period was used for the Meaning and Purpose item pool, because these outcomes were expected to change very slowly. Response options represented frequency and intensity in a 5-point Likert scale (see Table 4).

Results of the Cognitive Interviews

Cognitive interviews were carried out on 37 children for the initial set of SWB items—58 Positive Affect, 64 Life Satisfaction, and 57 Meaning and Purpose items. The sample showed heterogeneity across sex, race, and chronic conditions: 43% male, 51% children 8-11 years-old, 27% white, and 35% with a chronic condition. The rating of comprehension of all SWB items across all ages was: M = 2.8 (sd = 0.3). The average rating for the 8 to 11-year old was M = 2.6 (sd = 0.3), the average rating for the 12 to 18 years old was slightly higher with a M = 2.9 (sd = 0.2). Cognitive interviews supported children's capacity to use the 7-day recall period for Positive Affect, and the 4-week recall period for Life Satisfaction because the children could match their response to the question's response options.

There were 7 items that were poorly understood by children of all ages and these were deleted from the measures. These items included phrases such as “important things in life”, feeling “at ease,” “affectionate,” “ecstatic,” “attentive,” and “lively” (for examples of item exclusions/revisions see Table 4).

Several differences in the comprehension of items were found between 8-11 and 12-17 year-olds. Within the Life Satisfaction sub-domain, items less well understood by younger children tended to be more abstract evaluations of their lives (e.g., my life was ideal) or comparisons to inner reference points (e.g., happy with the way things are). The comprehensibility of items in the Meaning and Purpose sub-domain was a bit lower for younger children than older youth (M 2.6 for 8-11 year-olds and M 2.9 for 12-18 year-olds). Younger children poorly understood 4 out of 5 items using the word "purpose" and items using the words "optimism" were similarly poorly understood for young children.

Reading Level and Translability Analyses

The overall readability score of the remaining 172 items was 3.6th grade, indicating that reading level of the item pools was on average at the 8 to 9 year-old level. Readability for the Positive Affect sub-domain was grade level 1.5, for the Life Satisfaction subdomain 4.4, and for the Meaning and Purpose subdomain grade level 4.7.

There were 8 items that were ambiguously worded (e.g. "feeling *really* bad"), had idiomatic expressions (e.g. "Thinking about the past 4 weeks, my life was *the best/the worst*", "my life *works out*"), which were deleted, or interfered with the response categories *(e.g. "I had a lot of fun")*, which were kept for further psychometric analyses. Further, the translation experts advised to modify 3 items (e.g. change idiomatic wording "I have plans *to carry out* for my future" into simply "I have plans for my future"), which were kept after revision. Overall 8 items were excluded due to problems in the translatability review. For an overview of the deleted items and more detailed examples of item revisions and exclusions see Appendix 1.

Deletion of the 15 items during this qualitative methods described in this study did not affect the content coverage of the respective facets to which each one was assigned. This reassured us that the meaning of the construct assessed by the item pool did not change. The final item pools included a total of 164 SWB items--53 for Positive Affect, 56 for Life Satisfaction, and 55 for Meaning and Purpose.

Discussion

This manuscript describes the qualitative development of three subjective well-being (SWB) measures--Positive Affect, Life Satisfaction, and Meaning and Purpose—for children. Although other measures of children's positive affect and life satisfaction have been developed, we know of no measure that evaluates children's perspectives on how meaningful their lives are. This work is the first phase in an extensive item bank development process that follows the PROMIS scientific standards. The item pools are ready for calibration using item response theory methods. Although we devoted considerable effort to defining the theoretical basis of the constructs, obtaining expert, parent, and child input, it is likely that several items will be deleted from the item pools during the calibration process. Once the item bank calibration is complete, it will be necessary to reevaluate the resulting item pool to assess whether the items still measure the original target constructs, and if not, new definitions will be written to more specifically describe what is being measured.

Careful attention was paid to assuring the content validity of the SWB measures. To achieve this end, we developed a theoretically based description of the target constructs and their component concepts through review of the literature, interviews of experts, children, and parents, and iterative revisions based on input from these key informants. Once we had reached saturation in terms of no new concepts being generated either from these interviews or a review of extant pediatric SWB instruments, we finalized a SWB subdomain-facet-item concept map. This map was used to create item expressions (the item context, stem, and response set) that we tested for reading level, understandability in cognitive interviews, and translatability. These methods produced item pools that fully expressed children's experiences of positive affect, life satisfaction, and meaning and purpose. This comprehensive approach for achieving content validity is consistent with PROMIS (7) and FDA (2) scientific standards.

The *Positive Affect* items use a 7-day recall period and assess feelings of happiness, contentment, love, pride, and energy. Young children did not understand some positive emotion concepts, such as “ecstatic” and “affectionate,” so these words were dropped from the item pool. Because young children often talk about positive mood in concrete behavioral terms, we also included items such as “smiled a lot” and “laughed a lot,” which were concepts that emerged from our semi-structured interviews with children, indicating the amount of positive affect, pleasure or enjoyment.

The *Meaning and Purpose* sub-domain asks children to think about their life (as a whole) and about its meaning and purpose. Child interviews showed that even young children could answer questions about their life goals, positive expectations about their life, and ideas about life's meaning. Some concepts (e.g., “purpose”) appeared to be more poorly understood by younger children (less than 12 years-old) than older adolescents. These age-related differences may be a result of the development of abstract reasoning and meta-cognitions, which starts at age of 8 but progresses across adolescence (59;60). We have identified these item expressions, and will test them for differential item functioning once the item pool is administered in a large-scale field test. In this way, we will be evaluating item bank construction using a hypothesis-driven, mixed-methods approach.

The *Meaning and Purpose* item pool comprised items that the concepts of hope, optimism, purpose, meaning, and goal orientation. This SWB concept requires children to think about their current life, but importantly, about their future lives as well. Prior research suggests that children as young as 5 years have the capacity to think into the future (61;62). In our study, young and old children could name their goals for their future. This result is consistent with work by Anderson and colleagues (63) who found that goal setting (an executive function) develops between the ages of 7 to 9 and matures to the age of 12. Further empirical and theoretical studies are needed to enrich our knowledge of the development of SWB concepts and their associations with brain development (64-67) as well as cognitive and affective development (68-70).

Our process of qualitative development of the initial PROMIS Pediatric Subjective Well-Being (SWB) item pools was designed to produce item pools with high content validity that are ready for calibration (for future CAT use) and further validation using classical test and

item response theory methods. Within this process we identified as many eligible items as possible based on expert review and child and parent feedback. Starting with a systematic review of candidate item concepts and extant instruments for measuring SWB, we were able to build on the existing broad expertise in the field. We have designed a process to get feedback from children and adolescents regarding the conceptualization of each sub-domain of SWB (child and parent interviews) and on individual sub-domain items (cognitive interviews). A process of item pool generation including expert item review allowed us to classify items into conceptual facets; remove redundant items; and, create new items, while making these items more uniform with regard to their content and response options. By obtaining feedback from child and adolescent respondents on the sub-domain items, we improved the chance that our items reflect important child and adolescent experiences and increased the understandability and readability of our items.

Our study has limitations. First, each potential item was cognitively tested in a minimum of 5 children from different age groups and racial backgrounds. The specific number of cognitive interviews necessary to assure comprehension is not known for children, and it could be argued that a larger number could be more informative (71). However, due to experience on previous scale development projects (46;72) with very similar items we felt it was sufficient to perform 5 cognitive interviews on the SWB items. This number is also consistent with current PROMIS pediatric standards. Second, only 27% of the interviewed children were white, which raises the question of racial representativeness; however, no qualitative difference in comprehension by racial group was detected. Third, a possible limitation to our approach is that we wrote items de novo to express as comprehensively as possible every item concept identified. Each item expression comprised a context statement, stem, and response option set. Creation of items de novo precludes a direct comparison of the PROMIS SWB measures with other measures, although statistical linkage is still possible because of the use of item response theory methods to calibrate the items.

The next step in this research is to administer the items to several thousand children and parents to test the dimensionality of the item pools, evaluate items for monotonicity, calibrate the items using item response theory methods, and test items for differential item functioning (8). When that work is complete, we will have produced three new developmentally sensitive, theoretically grounded items banks for measuring SWB in children. These item banks could be statically linked with adult measures of the same concepts, forming a life course measurement system for SWB.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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List of Abbreviations

PROMIS	Patient Reported Outcome Measurement Information System
SWB	Subjective Well-Being
PRO	Patient-Reported Outcome
PCORI	Patient-Centered Outcomes Research Institute
FDA	Food and Drug Administration
IRT	Item Response Theory
CAT	Computer Adaptive Test

Medline	Database of Medical Literature
CINHAL	Cumulative Index to Nursing and Allied Health Literature
PsycINFO	Database of Psychological Literature
HaPI	Health and Psychosocial Instruments
PERMA	Positive Emotions, Engagement, Relationships, Meaning and purpose, and Accomplishments
LS	Life Satisfaction
PA	Positive Affect
MP	Meaning and Purpose

MIT ("more informative title")

This qualitative study describes the development of three Subjective Well-Being (SWB) measures for children assessing life satisfaction, positive affect, and meaning and purpose of life. The item pools were constructed based on review of the literature, interviews of experts in SWB, children, and parents, cognitive interviews of children, and a translatability review of each item. Content validation methods followed the scientific standards of the Patient Reported Outcome Measurement Information System (PROMIS). In upcoming studies the measures will undergo large-scale field-testing, calibration using item response theory, and assessment of the effects of child development on the constructs. In their fully mature form, the three measures will be fully calibrated item banks that support assessment of SWB using fixed-length short forms or computerized adaptive tests administered in clinical research and practice settings.

What is new?

Substantial attention has been devoted to assessing subjective well-being (SWB) among adults as a multi-dimensional, positively oriented concept that encompasses how well life is going for a person. There has been very little attention given to the developmental origins of SWB, whether these concepts are relevant to children's life experiences, health and coping with disease, and how best to measure SWB in pediatric populations. This manuscript describes the new qualitative development of pediatric SWB measures that are part of the NIH Patient Reported Outcome Measurement Information System (PROMIS). It adds to the literature by demonstrating that children were not only able to comprehend and respond to questions about their happiness and affect, but they were also able to provide evaluations of their life and understood the concepts of a meaningful life, optimism, and goal orientation. This improves and advances measurement of pediatric SWB by providing new measures of positive affect (53 items), life satisfaction (56 items), and the eudaimonic component of SWB expressed as meaning and purpose (55 items). It will be possible for researchers and clinicians to incorporate hedonic and eudaimonic aspects of subjective well being using this soon-to-be-available PROMIS measure when measuring health and quality of life in children. The SWB item pools described here are being calibrated to produce item banks that are ready for short form or computerized adaptive test administration in clinical trials, translational research, and population-based research. We encourage research regarding how various social and physical environmental exposures and child development affect SWB.

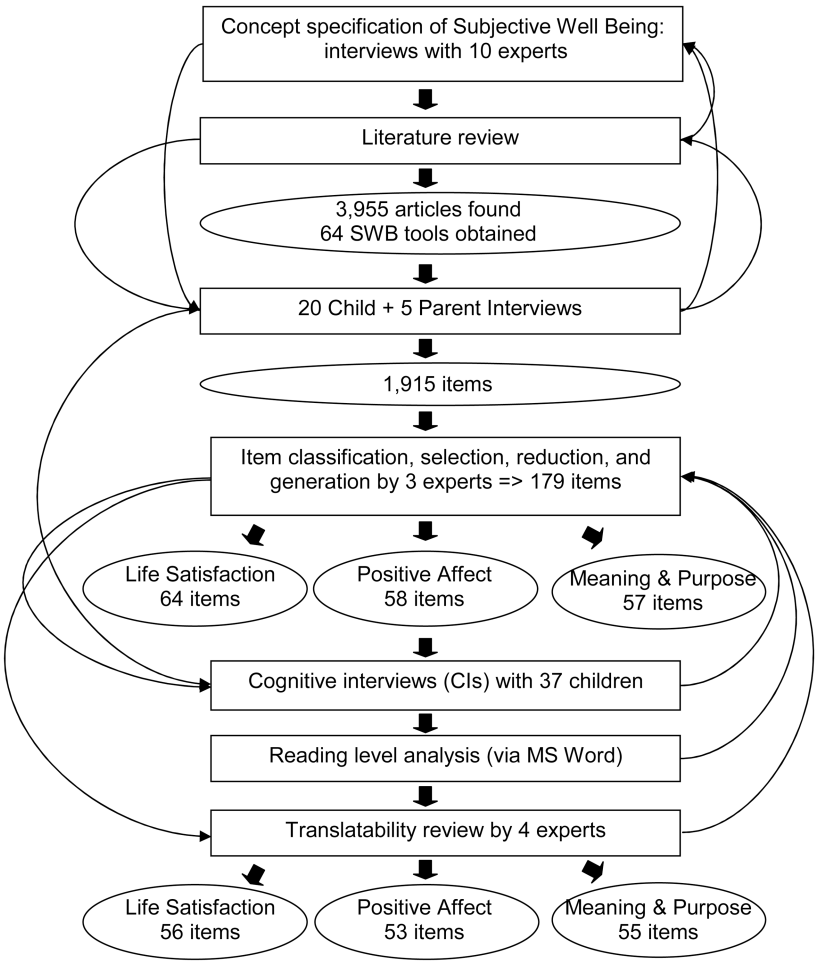

Figure 1. Workflow of the qualitative development of the Pediatric Subjective Well Being Item Bank

Table 1

Pediatric PROMIS Subjective Well-Being domain and sub-domain definitions

Domain	Definition
Subjective Well Being (SWB)	Subjective Well-Being comprises global evaluations of your life, positive and rewarding affective responses to the everyday circumstances of life, and the degree to which you feel your life is worthy. SWB has a positive valence. Individuals with high SWB are happy, engaged in interesting activities, fulfilling their goals, and satisfied with their lives. SWB is organized into hedonic (positive affect and life satisfaction) and eudaimonic (meaning, purpose) components. It also includes evaluative (life satisfaction and meaning and purpose) and experiential dimensions (positive affect). It does not include negative feelings or distress, which are categorized within the emotional distress branch of the PROMIS domain framework. SWB has three distinct subdomains: Life Satisfaction, Positive Affect, and Meaning and Purpose.
Subdomains	
Life Satisfaction	The *PROMIS Life Satisfaction* item bank assesses global and context-specific evaluations of your life. High levels result from favorable evaluations and an acceptance of how your life is being led. The subdomain comprises the facets of global evaluations of life, context-specific evaluations of life, assessments of life conditions, and comparisons of your life with others' lives. The *Life Satisfaction* item bank uses a 4-week reporting period.
Positive Affect	The *PROMIS Positive Affect* item bank assesses your experience of well-being measured as momentary positive or rewarding affective experiences. The subdomain includes feelings and mood comprising the facets of contentment, calmness, love, pride, happiness, excitement, and energy. The *Positive Affect* item bank uses a 7-day reporting period.
Meaning and Purpose	The *PROMIS Meaning and Purpose* item bank assesses your sense that life has purpose and there are good reasons for living. The subdomain comprises the facets of hopefulness, optimism, goal-directedness, and purpose. The *Meaning and Purpose* item bank does not use a recall period.

Table 2
Pediatric SWB Questionnaires Included in the Item Bank Development

Questionnaire name	# items	References
Life Orientation Test	10	Aspinwall
The Finnish questionnaire on adolescent values and	18	Astedt-Kurki, P.
LS and happiness measure from the Monitoring the	2	Bachman, J.G.
Big Five Questionnaire for Children	62	Barbaranelli, C.
Search Institute Profiles of Student Life: Attitudes and	39	Benson, P.L.
Healthy pathway child-report scales	13	Bevans, C.
The Minneapolis-Manchester Quality of Life Instrument	47	Bhatia, S.
Minneapolis-Manchester Quality of Life-Youth Form	32	Bhatia, S.
Personal Resource Questionnaire – Part II	55	Brandt, P.A. &
Future Expectations Inventory	13	Bush, S.F.
Adolescent General Well-Being Questionnaire	85	Columbo
Student Version of Comprehensive Quality of Life	7	Cummins, R.A.
The Optimism and Pessimism Scale	56	Dember, W.N.
The Satisfaction with Life Scale	5	Diener, E.
Quality of School Life Scale	27	Epstein, J.L.
Youth Life Orientation Test	14	Ey, S.
Multidimensional Students' Life Satisfaction Scale	52	Gilligan, T.D.
Goetz Enjoyment at different levels of generalization	4	Goetz,T.
Quality of My Life questionnaire	4	Gong, G.W.
Strengths and Difficulties Questionnaire	33	Goodman, R.
The Hope Scale	2	Gottschalk, L. A.
Berne Questionnaire on Adolescents' Subjective Well-	3	Grob, A.
Questions on Life Satisfaction FLZM	33	Henrich, G.
Student's Life Satisfaction Scale	7	Huebner, E.S.
Multidimensional Students' Life Satisfaction Scale	40	Huebner, E.S.
School Children's Happiness Inventory	30	Ivens, J.
Life satisfaction questions	1	Kahneman, D.
Psychology of Mind / Health Realization Happiness	2	Kelley, T.
Child Health Questionnaire	7	Landgraf J.M.
Quality of Life Headache in Youth Questionnaire	25	Langeveld, J.H.
Positive and Negative Affect Scale - Children	30	Laurent, J.
Profile of Mood States	65	Lorr, M.
Subjective Happiness Scale	4	Lyubomirsky
FACES Scale	62	MacDonald, P.M.
Self-generated adolescent goals	30	Massey, E.K.
Well-Being (Visual Analogue Scale)	2	Massey, E.K.
McLeod Indications for Measures of Psychological	12	McLeod, J.D.

Questionnaire name	# items	References
The Miller Hope Scale	40	Miller, JF
Moos Scale	3	Moos, R.H.
Open goal-elicitation procedure	33	Nurmi, J. –E.
Reasons for Living Inventory for Adolescents	32	Osman, A.
IMPACT III Quality of Life Questionnaire	35	Otley, A.
Values in Action Inventory for Youth	198	Park, N.
Youth Quality of Life Instrument	41	Patrick, D.L.
Phillips “What Makes You Feel X?”	5	Phillips, E.
KINDL-R	37	Ravens-Sieberer, U.
KIDSCREEN-52	52	Ravens-Sieberer, U.
Child Report Form of the CHIP-Child Edition	76	Riley A.W.
Pediatric Asthma Quality of Life Questionnaire	23	Robert D. A.
Personal Growth Initiative Scale	9	Robitschek, C.
Health-Related Quality of Life Measure for Children	25	Ronen, G.M
State-Trait-Cheerfulness Inventory	90	Ruch, W.
Life Orientation Test, Revised	10	Scheier, M.F.
The World Health Organization's quality of life	27	Skevington, S.M.
Children's Hope Scale	6	Snyder, C.R.
Child Health and Illness Profile - Adolescent Edition	11	Starfield, B.
Meaning in Life Questionnaire	10	Steger, M.F.
Pediatric Quality of Life Inventory 4.0	6	Varni, J.
How I Feel	30	Walden, T.A.
Warr Life satisfaction scales	33	Warr, P.B.
PANAS-Expanded Form	60	Watson, D. & Clark,
Personal Resource Questionnaire 2000	15	Weinert, C.
My Life Questionnaire	12	Weist, M.D.
The well-being questionnaire	22	Wiklund, I.
Wildrick QOL self-assessment in adolescents with	41	Wildrick, D.
Total	**1,915**	

Table 3
Results of 37 Child Interviews about Subjective Well-Being

Question	Unique Responses
"This kid has a good life." What does that mean?	feeling happy, good at school, has hobbies, does social thing with family or friends, does sports or exercise, healthy, no stress, has what she needs, spiritual, does not do drugs or drugs or drink alcohol, has free time, enough oxygen, has shelter
What do those kids do who have a good life?	go out, go on vacations, get an allowance, read, play games, have fun with family, have cook-outs, do good things, get attention, does things with friends, go to school, listen to parents, likes what he/she likes doing, enjoys her activities, make their friends laugh and smile
How do kids feel when they have a good life?	happy, proud, grateful, good, shocked that they are doing good, impressive, feel good about themselves, confident, feel that they can do things that they think they can do, can be what they really want to be, don't care if others criticize them, excited, playful
How is your life good?	good friends, being with my family, have good parents, get good grades, take vacations, feel healthy, help people, parents care about me, parents love me, parents by me things, parents support me, good coaches, play with friends, exercise, play sports, read, draw, sing, go to girl scouts, go out for dinner, eat right, am a good person, go trick or treating
What do you like about your life?	I am pretty happy, I like weekends, running, playing tennis, going to China town, hanging out with friends, running around the house, hanging with my friends
Would you change anything about your life?	I wish my parents were not divorced, I wish my talent would be more widespread at school and in sports, I want my dad to have more time for me, wish kids could do whatever they want, I like to drive a car, don't like chorus that much, more free time, spend more time with friends and at home, having no pain
What does it mean when you say, "My life has meaning?"	reason to be on the earth, my life is important, whatever you set your mind to you can do, do the best you can, can help people, something to live for, life has a reason, you are into doing the stuff you parents want to do, feel proud of your life, a big part of other peoples life, have things planned and expect things to happen, have something to wake up to, make a difference, try to make something better, do something you believe in, have opportunity (heart, love, responsibility), people will remember you when you die
What does it mean when you say, "My life has purpose?"	a reason to live, reason for what you are doing, to be loved, cared for, you are respected, people remember you, not lonely, you chose how to live your life, purpose of doing something, did something important, you are noticed by other people, do something for someone else, try to achieve your goals, do fun things, have something to come home to
What does it mean when you say, "I have goals in my life?"	go to college, get a good education, get a good job, achieve something, accomplish something, work towards your goals, play in a game, score some goals, overcome difficult things, always working on your life, push yourself forward to be what you want to be, control your life, something you're good at, someone to admire me, be rich

Table 4

Examples of Pediatric SWB item revisions / exclusions per domain

Dimension	Time Frame	Original Item	Revision/Exclusion	Reason for Revision / Exclusion	Response Option
Life Satisfaction	Thinking about the past 4 weeks…	my life was really good.	my life was very good.	"Really" ambiguous wording, translation problems.	not at all a little bit somewhat quite a bit very much
		my life was horrible.	-	Negative wording interfered with response option / double negative confused children.	
Positive Affect	In the past 7 days…	I felt very positive.	I felt positive.	Double positive wording confused children.	Never rarely sometimes often always
		I felt affectionate.	-	Poor understanding in young children.	
Meaning and Purpose	Thinking about your life,… indicate how much each statement is like you:	I make plans for my future.	I have plans for my future.	Young children don't make plans (active behavior), but rather have plans.	not at all a little bit somewhat quite a bit very much
		when I wake up, I think about the good things that will happen during the day.	-	Translation problems, and young children don't do this as often.	