



SLEEP MEASURE DIFFERENCES

A brief guide to differences between the PROMIS® Sleep instruments:

ADULT	PEDIATRIC	EARLY CHILDHOOD PARENT-REPORT	PARENT PROXY FOR PEDIATRIC
PROMIS Bank v1.0 – Sleep Disturbance	PROMIS Pediatric Bank v1.0 – Sleep Disturbance	PROMIS Early Childhood Parent-Report Bank v1.0 - Sleep Problems	PROMIS Parent Proxy Bank v1.0 – Sleep Disturbance
PROMIS Bank v1.0 – Sleep Disturbance (recommended)	PROMIS Pediatric Bank v1.0 – Sleep-Related Impairment	PROMIS Early Childhood Parent-Report Short Form v1.0 - Sleep Problems 4a	PROMIS Parent Proxy Bank v1.0 – Sleep-Related Impairment
PROMIS Bank v1.0 – Sleep Disturbance (screen-to-CAT)	PROMIS Pediatric Short Form v1.0 – Sleep Disturbance 4a	PROMIS Early Childhood Parent-Report Short Form v1.0 - Sleep Problems 4a	PROMIS Parent Proxy Short Form v1.0 – Sleep Disturbance 4a
PROMIS Bank v1.0 – Sleep-Related Impairment	PROMIS Pediatric Short Form v1.0 – Sleep-Related Impairment 4a	PROMIS Early Childhood Parent-Report Short Form v1.0 - Sleep Problems - Disturbance 4a	PROMIS Parent Proxy Short Form v1.0 – Sleep-Related Impairment 4a
PROMIS Short Form v1.0 – Sleep Disturbance 4a	PROMIS Pediatric Short Form v1.0 – Sleep Disturbance 8a	PROMIS Early Childhood Parent-Report Short Form v1.0 - Sleep Problems – Daytime Impairment 4a	PROMIS Parent Proxy Short Form v1.0 – Sleep Disturbance 8a
PROMIS Short Form v1.0 – Sleep-Related Impairment 4a	PROMIS Pediatric Short Form v1.0 – Sleep-Related Impairment 8a	PROMIS Early Childhood Parent-Report Short Form v1.0 - Sleep Problems 8a	PROMIS Parent Proxy Short Form v1.0 – Sleep-Related Impairment 8a
PROMIS Short Form v1.0 – Sleep Disturbance 6a			
PROMIS Short Form v1.0 – Sleep Disturbance 8a			
PROMIS Short Form v1.0 – Sleep-Related Impairment 8a			
PROMIS Short Form v1.0 – Sleep Disturbance 8b			
PROMIS Short Form v1.0 – Sleep Disturbance-OA-Knee 6a			

OA=osteoarthritis

ABOUT SLEEP

The Adult PROMIS Sleep Disturbance instruments assess self-reported perceptions of sleep quality, sleep depth, and restoration associated with sleep. This includes perceived difficulties and concerns with getting to sleep or staying asleep, as well as perceptions of the adequacy of and satisfaction with sleep. Sleep Disturbance does not focus on symptoms of specific sleep disorders, nor does it provide subjective estimates of sleep quantities (total amount of sleep, time to fall asleep, amount of wakefulness during sleep). The Sleep Disturbance short form is universal rather than disease-specific. It assesses sleep disturbance over the past seven days.

The Adult PROMIS Sleep-Related Impairment item bank focuses on self-reported perceptions of alertness, sleepiness, and tiredness during usual waking hours, and the perceived functional impairments during wakefulness associated with sleep problems or impaired alertness. Though Sleep-Related Impairment does not directly assess cognitive, affective, or performance impairment, it does measure waking alertness, sleepiness, and function within the context of overall sleep-wake function. The Sleep-Related Impairment short form is universal rather than disease-specific. It assesses sleep-related impairment over the past seven days.

The PROMIS Pediatric and Parent Proxy Sleep Disturbance item banks assess reported thoughts of one's sleep quality, and perceived difficulties with falling or staying asleep. Conceptual facets include sleep quality, sleep onset, and sleep continuity. The measures are universal rather than disease-specific. They assess sleep disturbance over the past seven days.



The PROMIS Pediatric and Parent Proxy Sleep-Related Impairment item banks assess perceptions of sleepiness during usual awake hours and reported impairments during the day associated with sleep problems or daytime sleepiness. Conceptual facets include daytime sleepiness, sleep offset, impact: cognitive, impact: activities, and impact: emotional. The measures are universal rather than disease-specific. They assess sleep-related impairment over the past seven days.

The PROMIS Early Childhood Parent-Report Sleep Problems item bank assesses young children's sleep disturbance, which reflects sleep quality pertaining to delayed sleep, sleep onset, and sleep continuity and sleep-related impairment, which reflects the impact of poor sleep on daytime functioning, routines, and mood. The Sleep Problems item bank is universal rather than disease-specific. It assesses sleep problems over the past seven days.

Sleep instruments are available for adults (ages 18+), pediatric self-report (ages 8-17), for parents serving as proxy reporters for their child (youth ages 5-17) or very young child (young children over ages 1-5).

INTRODUCTION TO ASSESSMENT OPTIONS

There are two administration options for assessing Sleep: short forms and computer adaptive tests (CATs). When administering a short form, instruct participants to answer all of the items (i.e., questions or statements) presented. With CAT, participant responses guide the system's choice of subsequent items from the full item bank. Although items differ across respondents taking CAT, scores are comparable across participants.

Some administrators may prefer to ask the same question of all respondents or of the same respondent over time, to enable a more direct comparability across people or time. In these cases, or when paper administration is preferred, a short form would be more desirable than CAT. This guide provides information on all Sleep short forms and CAT instruments.

CAT: A minimum number of items (e.g., 4) must be answered in order to receive a score for Sleep CATs. The response to the first item will guide the system's choice of the next item for the participant. The participant's response to the second item will dictate the selection of the following question, and so on. As additional items are administered, the potential for error is reduced and confidence in the respondent's score increases. CAT will continue until either the standard error drops below a specified level (e.g., on the T-score metric 3.0), or the participant has answered the maximum number of questions (e.g., 12), whichever occurs first. For some CATs, specifically, "recommended" and "screen-to-CAT" there are additional stopping rules. These include stopping when the standard error isn't improving much or if a respondent is asymptomatic. For the PROMIS Pediatric Bank v1.0–Sleep-Related Impairment and PROMIS Parent Proxy Bank v1.0–Sleep-Related Impairment CATs, the minimum number of items administered is 4. For details on the exact stopping rules for Sleep Disturbance CATs, see below.

CAT versus Short Form: Whether one uses a short form or CAT, the score metric is Item Response Theory (IRT), a family of statistical models that link individual questions to a presumed underlying trait or concept of sleep represented by all items in the item banks. When choosing between CAT and a short form, it is useful to consider the demands of computer-based assessment, and the psychological, physical, and cognitive burden placed on respondents as a result of the number of questions asked.

Figure 1 illustrates the correlations (strength of relationship) of the full Adult Sleep Disturbance bank with CAT and with short forms of varying length. The correlation of CAT scores with the full bank score is greater than a short form of any length. A longer CAT or longer short form offers greater correlation, as well as greater precision. When evaluating precision, not all questions are equally informative. The flexibility of CAT to choose more informative questions offers more precision.

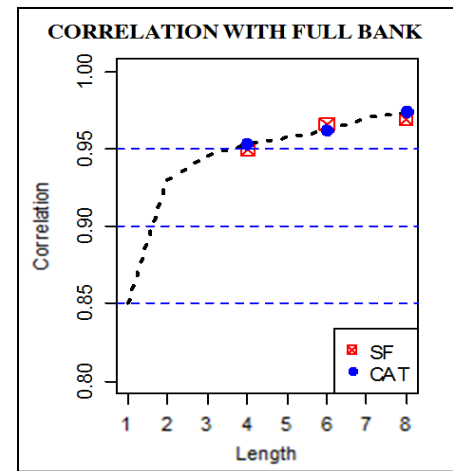


Figure 1

VERSION DIFFERENCES

The PROMIS Early Childhood Parent-Report Sleep Problems measures were previously named PROMIS Early Childhood Parent-Report Sleep Health. This name change was implemented in 2021.

Adult

Standard, Recommended, and Screen-to-CAT Stopping Rules: The standard, recommended, and screen-to-CAT Adult Sleep Disturbance computer adaptive tests are based on the exact same item banks, but utilize different stopping rules. The PROMIS Bank v1.0 – Sleep Disturbance measure is administered by default as computer adaptive tests using the following standard stopping rules:

- Minimum number of items administered = 4
- Stop when one of these occurs:
 - 12 items are administered OR
 - Standard error is below 0.3 on the theta metric (3.0 on the T-score metric)

The PROMIS Bank v1.0 – Sleep Disturbance (recommended) measure uses the following stopping rules:

- Minimum number of items administered = 4
- Stop when one of these occurs:
 - 8 items are administered OR
 - Standard error is below 0.3 on the theta metric (3.0 on the T-score metric) OR
 - Standard error changes by less than 0.01 on the theta metric (0.1 on the T-score metric)

The PROMIS Bank v1.0 – Sleep Disturbance (screen-to-CAT) measure uses the following stopping rules:

- If the response to the first item is the “healthiest” response then stop.
- If the response to the first item is NOT the “healthiest” response, proceed with the “recommended” CAT stopping rules.

SHORT FORM DIFFERENCES

Adult

There are multiple Sleep Disturbance short forms for adults.

Sleep Disturbance Profile Short Forms: Items in the 4a, 6a, and 8a short forms were selected based on rankings using two psychometric criteria: (1) maximum interval information; and 2) CAT simulations. Item rankings were similar for both criteria. For the maximum interval criterion, each item information function was integrated (without weighting) for the interval from the mean to 2 SDs worse than the mean. For the CAT simulations, responses to all items in each bank were generated using a random sample of 1,000 simulees drawn separately for each bank (centered on 1.0 SD worse than the general population mean). Items were rank ordered based on their average administration rank over the simulees. Content experts reviewed the items and rankings and made cuts of 8, 6, and 4 items. For each domain, 4-item, 6-item and 8-items have been selected so that the items are nested/overlap (e.g., the 8-item form is the 6-item form plus two additional items). The 4a, 6a, and 8a short forms can be administered with short forms of similar length from other domains (physical function, anxiety, pain interference, fatigue, depression, and ability to participate in social roles and activities v2.0) as part of a PROMIS Profile (see PROMIS-29, -43, or -57 Profile), though they can also be administered individually.

Additional Sleep Disturbance Short Forms: The original adult short form (8b) was constructed by the domain team with a focus on representing the range of the trait and also representing the content of the item bank. Domain experts reviewed short forms to give input on the relevance of each item. Each domain group worked independently and the original short forms are 6-10 items long depending on the domain. Psychometric properties and clinical input were both used and likely varied in importance across domains.

The **PROMIS Short Form v1.0 – Sleep Disturbance-OA-Knee 6a** measure consists of 6 items from the PROMIS Sleep Disturbance v1.0 Item Bank. The Sleep Disturbance-OA (osteoarthritis)-Knee 6a is designed to measure self-reported sleep quality, sleep depth, and restoration associated with sleep. Items assess condition-specific issues but do not specifically reference knee arthritis. In this way, the measure uses generic/universal items that could be used in other patient populations, but the measure's content is tailored to people with knee arthritis. Like other PROMIS Sleep Disturbance items, this measure assesses Sleep Disturbance over the past 7 days.

Adult Sleep-Related Impairment Short Forms

There are 2 Adult Sleep-Related Impairment short forms. Items were selected based on content and psychometric characteristics. Short form items are nested or overlap (e.g., an 8-item short form is the 4-item short form plus 4 additional items).

Pediatric and Parent Proxy Sleep Disturbance and Sleep-Related Impairment Short Forms

Sleep Disturbance and Sleep-Related Impairment each have 2 Pediatric and 2 Parent Proxy short forms. Items were selected based on content and psychometric characteristics. Short form items are nested or overlap (e.g., an 8-item short form is the 4-item short form plus 4 additional items).

Selecting a Sleep Disturbance and Sleep-Related Impairment Short Form

In selecting between short forms, the difference is instrument length. The reliability and precision of the short forms within a domain is highly similar. If you are working with a sample in which you want the most precise measure, select the longest short form. If you have little room for additional measures but really wanted to capture something as a secondary outcome, select one of the shorter instruments (e.g., 4-item short form).

Early Childhood Parent-Report Forms

There are four PROMIS Early Childhood Parent-Report short forms. Items in the Sleep Problems 4a and 8a short forms were selected based on content coverage of the key domain facets of the overall item bank and psychometric characteristics. Items in the Sleep Problems – Disturbance 4a and Sleep Problems – Daytime Impairment 4a were selected based on subdomain content coverage (i.e., sleep disturbance and sleep-related daytime impairment, respectively) and psychometric characteristics. Items in the subdomain short forms are nested/overlap with the items in the Sleep Problems domain short forms (i.e., the 8-item Sleep Problems domain short form is comprised of the two subdomain 4-item short forms; the 4-item Sleep Problems domain short form is comprised of two items from each of the subdomain short forms).

Recommended Early Childhood Parent-Report Short Form

The primary difference between the two Early Childhood Parent-Report short forms is content and length. The Sleep Problems 4a and 8a cover both sleep disturbance and sleep-related daytime impairment, while the Sleep Problems – Disturbance 4a and Sleep Problems – Daytime Impairment 4a cover content pertaining to these specific subdomains. The reliability and precision of the short forms is highly similar. If you are working with a sample in which you want the most precise measure and coverage across the entire domain, select the 8-item form. The 8-item form is also superior for individual evaluation/comparing small groups. If you have little room for additional measures but still want to capture the domain, select the 4-item form. Either form is sufficient for large group comparison. Alternatively, select the 4-item subdomain short forms if you want more precise measurement of sleep disturbance or sleep-related daytime impairment but do not have enough room to include both.

Parent Proxy Report Versus Early Childhood Parent-Report Measures

The PROMIS Parent Proxy measures are for parents to report on their children ages 5-17. The PROMIS Early Childhood Parent-Report measures are for parents to report on their children ages 1 to 5. In both cases, the parent provides his or her perspective about the child's sleep problems. Scores from PROMIS Parent Proxy and PROMIS Early Childhood Parent-Report measures are calibrated and normed with different, age-appropriate reference populations and therefore are on different metrics. Scores from one should not be compared to scores on the other. For parents of 5-year-old children, either the PROMIS Parent Proxy or the PROMIS Early Childhood Parent-Report measure can be used. In general, for longitudinal research and/or on-going clinical follow-up, using the measure that aligns with the majority of the time frame with which the child will be studied is recommended. For example, if the measure is administered at child age 1 year through child age 5, using the PROMIS Early Childhood Parent-Report is recommended. If the child will be studied across in both early childhood and beyond age 5, switching to the PROMIS Parent Proxy measure is necessary.

SELECTING A PEDIATRIC OR PARENT PROXY SLEEP DISTURBANCE AND SLEEP-RELATED IMPAIRMENT INSTRUMENT

In selecting whether to use the pediatric or parent proxy instrument for these domains, it is important to consider both the population and the domain which you are studying. Pediatric self-report should be considered the standard for measuring patient-reported outcomes among children. However, circumstances exist when the child is too young, cognitively impaired, or too ill to complete a patient-reported outcome instrument. While information derived from self-report and proxy-report is not equivalent, it is optimal to assess both the child and the parent since their perspectives may be independently related to healthcare utilization, risk factors, and quality of care.

SCORES

For most PROMIS instruments, a score of 50 is the average for the United States general population with a standard deviation of 10 because calibration testing was performed on a large sample of the general population. You can read more about the calibration and centering samples on HealthMeasures.net (<http://www.healthmeasures.net/score-and-interpret/interpret-scores/promis>). The T-score is provided with an error term (Standard Error or SE). The Standard Error is a statistical measure of variance and represents the “margin of error” for the T-score.

Important: A higher PROMIS T-score represents more of the concept being measured. For negatively-worded concepts, like Sleep Disturbance, Sleep-Related Impairment, and Sleep Problems, T-scores of 60 are one SD worse than average. By comparison, Sleep Disturbance, Sleep-Related Impairment and Sleep Problems T-scores of 40 are one SD better than average.

STATISTICAL CHARACTERISTICS

There are four key features of the score for Sleep:

- **Reliability:** The degree to which a measure is free of error. It can be estimated by the internal consistency of the responses to the measure, or by correlating total scores on the measure from two time points when there has been no true change in what is being measured (for z-scores, reliability = $1 - SE^2$).
- **Precision:** The consistency of the estimated score (reciprocal of error variance).
- **Information:** The precision of an item or multiple items at different levels of the underlying continuum (for z-scores, information = $1/SE^2$).
- **Standard Error (SE):** The possible range of the actual final score based upon the scaled T-score. For example, with a T-score of 52 and a SE of 2, the 95% confidence interval around the actual final score ranges from 48.1 to 55.9 ($T\text{-score} \pm (1.96 * SE) = 52 \pm 3.9 = 48.1 \text{ to } 55.9$).

The final score is represented by the T-score, a standardized score with a mean of 50 and a standard deviation (SD) of 10.

In Figure 2 (adult Sleep Disturbance 8b short form) and Figure 3 (adult Sleep-Related Impairment 8a short form), the dotted horizontal lines represent degrees of internal consistency reliability (i.e., .90 or .95) typically regarded as sufficient for accurate individual scores. The shaded blue regions mark the ranges of the scales where measurement precision is comparable to the reliability of .90 for the eight-item forms. Figures 2 and 3 also tells us where on the scales the forms are most informative based upon the T-scores. These forms would typically be more informative than a Sleep Disturbance or a Sleep-Related Impairment form with fewer items.

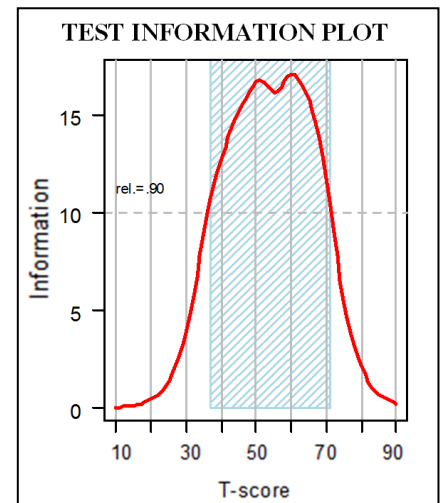


Figure 2

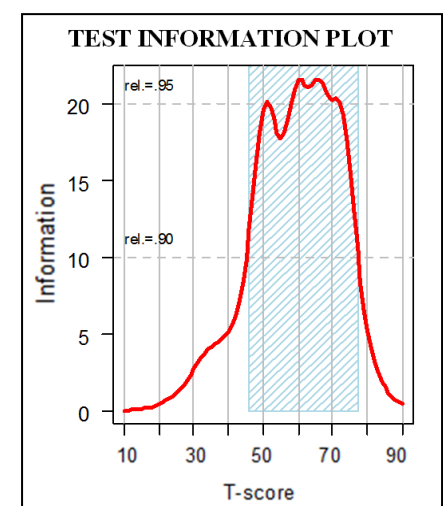


Figure 3

**Early Childhood Parent-Report Item Bank
Test Information Plot**

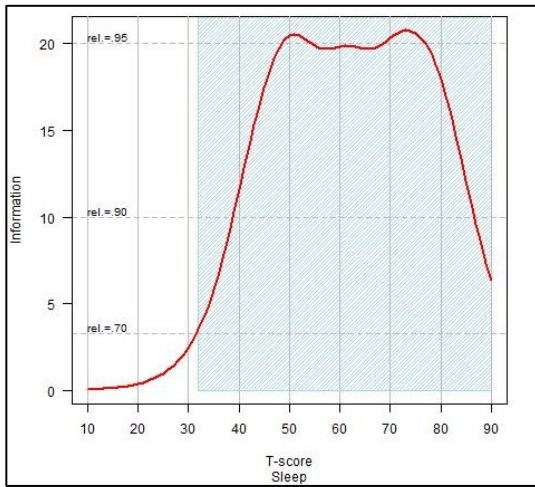


Figure 4

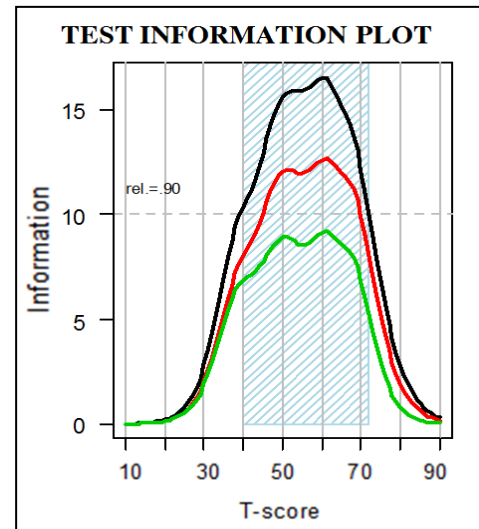


Figure 5

The three dotted horizontal lines in Figure 4 each represent a degree of internal consistency reliability (i.e., .70, .90, or 0.95) typically regarded as sufficient for an accurate individual score for the Early Childhood Parent-Report Sleep Problems bank. The shaded blue region marks the range of the scale where measurement precision is comparable to the reliability of .70 for the form.

Figure 5 (adult 4a, 6a & 8a Sleep Disturbance short forms) also tells us where on the scale the form is most informative based upon the T-score: the 8-item form is more informative than the 6-item form, which is more informative than the 4-item form.

Figure 6 (Sleep Disturbance) and Figure 7 (Sleep-Related Impairment) are samples of the statistical information available for the CATs.

More information is available at HealthMeasures.net.

Scaling Model Used For Calibration	Graded Response Model (GRM)
Total Number of Items	27

Sample	N	Alpha Reliability
Sleep Calibration	2252	0.97

Score Distributions									
	Mean	SD	P5	P10	P25	P50	P75	P90	P95
Raw	60.73	23.88	30.00	33.00	40.00	56.00	78.00	96.00	105.00
Scale	49.78	10.30	33.44	36.49	42.09	49.42	57.22	63.40	66.51

										Min	Max
Scale Score	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	10.0	90.0
SE	2.30	.90	.40	.20	.20	.20	.20	.30	.60		
Reliability	.00	.16	.87	.96	.97	.97	.97	.92	.68		

Figure 6

Scaling Model Used For Calibration	Graded Response Model
Total Number of Items	16

Sample	N	Alpha Reliability
Sleep Calibration	2252	0.95

Score Distributions									
	Mean	SD	P5	P10	P25	P50	P75	P90	P95
Raw	34.84	13.23	18.45	20.00	24.00	32.00	44.00	54.00	61.00
Scale	50.00	9.81	34.59	37.41	43.03	49.52	56.89	63.18	66.73

										Min	Max
Scale Score	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	10.0	90.0
SE	2.20	.90	.40	.30	.20	.20	.20	.30	.80		
Reliability	.00	.13	.80	.90	.97	.97	.97	.91	.35		

Figure 7

PREVIEW OF SAMPLE ITEM

Figure 8 is an excerpt from the paper version of the Adult Sleep Disturbance v1.0 8a short form. This is the paper version format used for all Sleep Disturbance instruments. It is important to note, CAT is not available for paper administration.

In the past 7 days...		Response Scale				
		Not at all	A little bit	Somewhat	Quite a bit	Very much
Sleep116	My sleep was refreshing	<input type="checkbox"/> 5	<input type="checkbox"/> 4	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1
Sleep20	I had a problem with my sleep	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

Figure 8

FREQUENTLY ASKED QUESTIONS (FAQ)

Q: I am interested in learning more. Where can I do that?

Review the HealthMeasures website at www.healthmeasures.net.

Q: Are these instruments available in other languages?

Yes! Look at the HealthMeasures website (<http://www.healthmeasures.net/explore-measurement-systems/promis/intro-to-promis/available-translations>) for current information on PROMIS translations.

Q: Can I make my own short form?

Yes, custom short forms can be made by selecting any items from an item bank. This can be scored using the Scoring Service (https://www.assessmentcenter.net/ac_scoring-service).