The Content Validity and Inter-Rater Reliability of the Occupational Therapy Pediatric Inventory of Cognitive Skills (OT-PICS): An Assessment Tool of Functional Cognition in Children

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ABSTRACT
The Occupational Therapy Pediatric Inventory of Cognitive Skills (OT-PICS) is being developed to evaluate functional cognition skills in children in the domains of play, educational participation, and self-care. This study aimed to determine the content validity and inter-rater reliability of the OT-PICS. Seven content experts agreed that all 15 items of the tool are essential items to examine functional cognition in children ($k = 0.71–1.0$; I-CVI = 0.71–1.0; S-CVI = 0.96). The OT-PICS also has moderate reliability (ICC = 0.63) between nine trained raters. The tool was then revised and refined for clarity based on therapist's comments and feedback.

Introduction
Each year, approximately three million children are hospitalized for a critical illness in the United States (Witt et al., 2014). Children who have been hospitalized have a variety of physical, psychological, cognitive, and socioemotional needs. While the average length of stay for children admitted to the pediatric ICU (PICU) may only be a few days, PICU survivors often experience medical complications that increase their risk of prolonged weakness, delayed recovery, as well as functional, physical, and cognitive disabilities (Cui et al., 2017). Patients often face significant and persistent long-term impairments in all functional domains. Following hospital admissions, children can experience moderate to severe physical, global, and cognitive impairments (Choong et al., 2014). Physical impairments include muscle weakness or paralyzes, while global and cognitive impairments include delayed psychomotor development, as well as concentration and social-behavioral disturbances. Long-term cognitive impairments following...
hospitalizations often remain undetected and relatively underexplored in hospitalized children (Pollack et al., 2014).

Cognitive limitations may include but are not limited to specific impairments in cognitive skills and executive functions, such as sustained attention, problem-solving, planning, memory, self-monitoring, and self-regulation (Bone et al., 2014). These cognitive dysfunctions can present as an inability to use effective information-processing strategies, to self-monitor performance during engagement in occupations, and inability to generalize learned skills to various contexts (Pinto et al., 2017). Although many critically ill children make significant gains in recovery of physical capacities during hospital stays, cognitive dysfunction is often still present at the time of discharge, contributing to poorer overall health outcomes, higher risk for readmission, increased emotional burdens on families, as well as challenges that influence growth, development, and successful occupational participation (Bone et al., 2014; Knoester et al., 2008; Pollack et al., 2014).

Cognitive skills are vital for successful engagement in virtually all daily occupations. In children, cognition plays an essential role in development, learning, and growth (Champagne et al., 2013; Giles et al., 2020). Cognition refers to the information-processing functions carried out by the brain and includes both basic level skills (e.g. attention, memory, sequencing) and higher-level executive functions (e.g. planning, problem-solving, error detection). Functional cognition is more specifically defined as the ability of individuals to use and integrate their thinking/processing skills to accomplish desired tasks in their everyday lives given the totality of their abilities in context (American Occupational Therapy Association (AOTA), 2013). While much of the literature in functional cognition has been framed within the domains of occupational therapy with primarily adult populations (Champagne et al., 2013; Giles et al., 2020), in children, functional cognition can be framed as the intersection of cognitive skills with their primary occupations: self-care, play, and learning. There are a multitude of assessments available to examine physical, developmental, behavioral, and psychosocial skills in typically developing children, however, there is a gap in available performance-based assessments to evaluate functional cognition in critically ill children (Dumas and Grajo, 2021). Table 1 provides an overview of these commonly used cognitive assessments.

**The Occupational Therapy Pediatric Inventory of Cognitive Skills (OT-PICS)**

Developing a multi-modal measure of functional cognition for critically ill children will assist in bridging the current gap between available
The Occupational Therapy Pediatric Inventory of Cognitive Skills (OT-PICS) is proposed to assess functional cognition in critically ill children. The OT-PICS will assess cognitive skills for play, self-care, learning, and educational participation, primary occupations of children as defined by the Occupational Therapy Practice Framework, 4th edition (American Occupational Therapy Association (AOTA), 2020).

The development of the OT-PICS was influenced by several standardized and non-standardized tools such as The Pediatric Evaluation of Disability Inventory (PEDI) (Haley et al., 1992), Hawaii Early Learning Profile (HELP) (Warshaw et al., 2013), and the Pediatric Cerebral Performance Category (PCPC), and Pediatric Overall Performance Category (POPC) (Fiser et al., 2000). These validated measures are helpful in providing a quick screening tool that allows practitioners to gather a large amount of objective data. However, most of the assessments utilized in current practice require specialized training to administer, are subjective in nature, and measure isolated cognitive skills. While these assessments are helpful in providing information on risk factors and the presence of cognitive dysfunction, there continues to be a gap in assessments that examine functional cognition, that means, cognition as directly related to meaningful occupational performance in children. There continues to be a need for the development and use of multi-modal assessments that examine a child’s capacity to functionally participate in essential occupations given the totality of their abilities in context, rather than simply understanding cognitive skills in isolation (Giles et al., 2020).

**Table 1.** Overview of cognitive assessments used in critically ill children (adapted with permission from Dumas and Grajo, 2021).

<table>
<thead>
<tr>
<th>Assessment and intended population</th>
<th>Domain assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pediatric Evaluation of Disability Inventory (children 0–8 years) (Haley et al., 1992)</td>
<td>Cognition</td>
</tr>
<tr>
<td>Pediatric Overall Performance Scale &amp; Pediatric Cerebral Performance Scale (critically ill/injured children ages 0–18) (Fiser et al., 2000)</td>
<td>Cognition, Overall Short-Term Disability</td>
</tr>
<tr>
<td>Modified Glasgow Outcome Scale (pediatric ICU patients 0–18) (Butt et al., 1990)</td>
<td>Communication</td>
</tr>
<tr>
<td>Functional Status Scale (hospitalized children 0–18) (Pollack et al., 2009)</td>
<td>Mental Status</td>
</tr>
</tbody>
</table>

Intended population, setting, test item selection, and construction

Due to medical and technological advancements, children who experience both acute and chronic life-threatening illness and injury today have a higher rate of survival following a hospitalization. However, critically ill children experience significant medical complications throughout recovery that can create...
occupational challenges due to cognitive dysfunction. The cognitive impairments in critically ill children can present as an inability to utilize effective information processing strategies, self-monitor performance during engagement in occupations, and inability to generalize learned or re-learned skills to various contexts. These skills or loss of skills are not always observed in traditional cognitive measures in children, as they do not require children to perform typical occupations in context (Dumas and Grajo, 2021; Pinto et al., 2017).

The OT-PICS measures children's functional cognition skills including working memory, attention, error detection, and problem-solving and adaptive capacity in the context of engagement in childhood occupations, as essential skills for children's successful participation in desired occupations. The OT-PICS is intended to be used with critically ill children ages 3:0–7:0 who are hospitalized in a pediatric intensive care unit, pediatric step-down unit, or general pediatric unit.

This tool is to be used as a non-standardized inventory to assess current levels of some fundamental cognitive skills for occupational performance in children, rather than a comprehensive, normed assessment of all cognitive skills needed in same-aged children. The OT-PICS is considered a criterion-based assessment, meaning that it compares a child's performance based on mastery of a specific set of standard (i.e. proficiency), as opposed to a norm referenced measure, that compares a child's performance to a larger group (i.e. same aged children) (Bond, 1996). It does not aim to measure the magnitude or severity of loss of cognition prior to illness or disability or cognitive dysfunction due to developmental delays, but instead aims to capture the child's functional level of cognition at the time of evaluation to assess how occupational therapy can help remediate and improve occupational performance.

The purpose of this study is to determine the preliminary content validity and inter-rater reliability of the OT-PICS. Specifically, this study aims to answer the following questions:

1. Do the subscale items and rating scale of the OT-PICS represent content valid items for inclusion in a measure of functional cognition in children as determined by content experts?
2. Does the OT-PICS demonstrate reliability in scoring children's performance among varied raters?

Methods

Design

The researchers used classical test theory (CTT) and an instrument development design. The ultimate goal of CTT is to establish that items assessed
represent the true score (validity) and scores reflect the minimal measurement error possible (reliability) (Allen & Yen, 2002). The current study consisted of two phases: (1) content validity testing, review, and revision of the tool, and (2) analysis of inter-rater reliability of the OT-PICS and additional revisions. Phase 1 assessed the content validity of the OT-PICS through a panel of seven content experts. Content validity aims to determine the degree to which an assessment measure is representative or relevant of the construct it is designed to measure (Zamanzadeh et al., 2015). Phase 2 assessed the inter-rater reliability via score correlations of nine pediatric occupational therapists. Inter-rater reliability aims to measure the consistency of agreement of multiple raters (Hallgren, 2012). This study was approved by Columbia University Irving Medical Center Institutional Review Board and all participants provided written consent prior to the start of the study.

**Participants**

**Content validity**
The researchers invited seven participants recruited via a web search of occupational therapists with expertise in pediatric practice and functional cognition to review the OT-PICS. Recent related publications in occupational therapy journals served as starting point in the content experts search. To be included in the study, the experts must have had: (1) five or more years of clinical experience with pediatric populations and (2) published three or more peer-reviewed articles or book chapters related to the topic. The experts were recruited via email either from information on their recent publication or scholarly/academic web pages. All seven participants were registered occupational therapists with a wide range of practice experience (11–16+ years); all content experts had obtained a doctorate (PhD n = 5, OTD n = 2); and all experts have multiple publications (range of 6–16 peer-reviewed articles or chapters). Additionally, all experts have had multiple peer-reviewed presentations related to the topic and except for one who works in a school system full time, all currently work as researchers and/or academic educators.

**Inter-rater reliability**
The researchers invited 10 pediatric occupational therapists as participants via convenience sampling from the researchers’ network of clinicians to examine the inter-relater reliability of the OT-PICS. To be included in the study, clinicians must have at least one year of experience working with children. The participants received a minimum of two hours of training through a video with case examples uploaded in a secure and dedicated web page. A total of nine participants completed the consent process and
trainings (one participant was unable to complete the training requirements within the requested time frame). All nine participants were registered occupational therapists. The participants had a range of practice experience (range of 2.5–7 years, \( M = 3.7 \) years) and practice areas (school-based, hospital/acute care setting, clinic-based setting).

**Instrument**

**Description**

The OT-PICS is a multi-modal, non-standardized assessment, conducted via observation and supplemental interview with parent/caregiver. There are three essential occupations examined in this tool, including play, self-care, and educational participation as defined by the *Practice Framework* (AOTA, 2020). The occupation of play encompasses engagement in a structured planned play task with a clear, age-appropriate sequence of steps, that is appropriately challenging for the child (e.g., Simon Says, hopscotch, board games, etc.). Self-care encompasses engagement in an age-appropriate activity of daily living completed by a child, that has a clear sequence of steps and is appropriately challenging for the child (i.e., oral-care, dressing, eating, etc.). Educational participation includes age-appropriate familiar preschool or school-based activities with a clear sequence of steps (i.e., cutting, coloring, shapes, pre-writing, handwriting). Essential observable elements of functional cognition for each sub-domain include (1) Working memory (the child's ability to accurately remember the steps of a given task); (2) Sustained attention (the child's ability to sustain attention to the necessary elements of a given task for the duration of the task); (3) Sequencing (the child's ability to identify the required steps of a given task in the correct order); (4) Error detection (the child's ability to recognize erroneous performance during and following engagement in a desired task); and; (5) Problem-solving and adaptive capacity (the child's ability to monitor performance during a task in order to self-generate and use alternate strategies when encountering obstacles during performance) (see Table 2) (AOTA, 2020).

**Scoring**

Each item is scored according to a scale of 1–5 with specific criteria descriptions for each item. A score of 1 signifies that the child is unsuccessful in performing the required skill relative to the occupation chosen, indicating that the skill has not yet developed. Scores between 2–4 signify that the child is able to perform varying levels of the skill relative to the occupation, with cues and/or prompting, indicating that the skills are emerging. A score of 5 indicates that sufficient skill level has been achieved.
for a child to successfully functionally engage in the task. For example, when examining sequencing during play, if a child is able to identify over 50–75% of the steps to successfully engage in one cycle of the novel play task, they will be given a score of 4. If the child is able to identify 25–50% of the required steps of the activity, they will receive a score of 3, and if they are able to identify less than 25% of the steps, they will receive a score of 2. Scores will be recorded on the graph sheet provided at the end of the inventory. Depending on if the assessor administers one or all of the sub-domain sections, scores can be totaled to provide a sub-domain specific interpretation score for play, self-care, or educational participation. The examiner identifies and circles the representing criterion that illustrates the skill level of the child within each sub-domain on the scoring form (See Table 2 for an overview of test items and Figure 1 for a sample criterion scoring for the domain of Play). Scores are then plotted on the graph sheet provided at the end of the inventory. The inventory takes between 15 and 30 minutes to administer.

The information gathered from the OT-PICS assessment can provide valuable information to interdisciplinary team members regarding persistent cognitive dysfunction during performance of childhood occupations. Findings can potentially assist with environmental modifications during the child's hospital stay to promote safe, successful engagement, safe discharge planning, provide justification or recommendations for continued therapy services following hospital discharge, as well as help practitioners tailor interventions to target areas of cognitive weakness in critically ill children throughout the recovery process.

Table 2. Test items in the OT-PICS.

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Functional cognition domains</th>
<th>Rating scale (with specific criteria per scale and skill)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Play</td>
<td>1. Working Memory—the child's ability to accurately remember the steps of a given task</td>
<td>1 = Skill not yet developed</td>
</tr>
<tr>
<td></td>
<td>2. Sustained Attention—the child's ability to sustain attention to the necessary elements of a given task for the duration of the task</td>
<td>2–4 = Skill emerging</td>
</tr>
<tr>
<td></td>
<td>3. Sequencing—the child's ability to identify the required steps of a given task in the correct order</td>
<td>5 = Sufficient skill level achieved to functionally engage in task</td>
</tr>
<tr>
<td></td>
<td>4. Error Detection—the child's ability to recognize erroneous performance during and following engagement in a desired task</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Problem Solving &amp; Adaptive Capacity—the child's ability to monitor performance during a task in order to self-generate and use alternate strategies when encountering obstacles during performance</td>
<td></td>
</tr>
<tr>
<td>Self-care</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational participation</td>
<td>1. Working Memory—the child's ability to accurately remember the steps of a given task</td>
<td>1 = Skill not yet developed</td>
</tr>
<tr>
<td></td>
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for a child to successfully functionally engage in the task. For example, when examining sequencing during play, if a child is able to identify over 50–75% of the steps to successfully engage in one cycle of the novel play task, they will be given a score of 4. If the child is able to identify 25–50% of the required steps of the activity, they will receive a score of 3, and if they are able to identify less than 25% of the steps, they will receive a score of 2. Scores will be recorded on the graph sheet provided at the end of the inventory. Depending on if the assessor administers one or all of the sub-domain sections, scores can be totaled to provide a sub-domain specific interpretation score for play, self-care, or educational participation. The examiner identifies and circles the representing criterion that illustrates the skill level of the child within each sub-domain on the scoring form (See Table 2 for an overview of test items and Figure 1 for a sample criterion scoring for the domain of Play). Scores are then plotted on the graph sheet provided at the end of the inventory. The inventory takes between 15 and 30 minutes to administer.

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Background

The sub-domains and items of the OT-PICS were developed after completing a scoping review of the literature and a practice guideline on assessments used by healthcare providers in evaluation of critically ill children (Dumas and Grajo, 2021). The aim of the scoping review was to synthesize the current literature on functional outcome tools utilized by healthcare providers in the assessment of pediatric critical care patients, identify gaps in the assessment practices, and discuss implications for occupational therapy practice. Findings from the scoping review revealed that the majority of assessments utilized to examine global impairments are substantial in hospitalized children, however, most global assessments only provide a single summary score, indicating the presence of functional impairment, but not how impairments can impact functional participation in children. Many assessments also use contrived tasks rather than meaningful, child or parent-chosen activities.

A scholar expert (second author) with multiple publications on instrument development and validation, guided the methodical process of identifying latent, sub-latent, and observable variables to be included in the inventory based on findings from the scoping review. After drafting the OT-PICS, the tool was beta-tested using two typically developing children within the identified age range in a large metropolitan city. An iterative process of review, refinement, and rating scale item clarification were completed by the authors to develop the validation version of the inventory for this study.

Data collection

Content validity

After the consent process, the researchers sent an electronic copy of the OT-PICS for review by the experts, as well as a link to an electronic survey tool to collect data. The reviewers used a four-point ordinal scale

<table>
<thead>
<tr>
<th>Item</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detecting an Error or Challenge</td>
<td>A performance breakdown was apparent, but child does not recognize ANY error or challenge during play performance</td>
<td>A performance breakdown was apparent, and child recognizes ANY one error or challenge in play performance with a more specific visual or verbal prompt (illustrating/showing what to do, phrase or sentence question)</td>
<td>A performance breakdown was apparent, and child recognizes ANY one error or challenge in play performance with a simple visual or verbal prompt (pointing, sound cue)</td>
<td>A performance breakdown was apparent, and child recognizes ANY one error or challenge in play performance without any cues and prompts</td>
<td></td>
</tr>
</tbody>
</table>

Additional Observations:

Figure 1. Detecting an error or challenge scoring criteria for the play domain in the OT-PICS.
to assess relevance for each inventory item as (1) not relevant, (2) somewhat relevant, (3) quite relevant, (4) highly relevant to determine item level and scale level content validity (Polit et al., 2007). Following review of each sub-domain, an open-ended question was provided to allow for feedback or comments.

Inter-rater reliability
In order to assess inter-rater reliability, the researchers sent an electronic copy of the OT-PICS for review and a link to the private OT-PICS web page with an online training module. The training program included review and discussion of the administration of the tool, several scoring exercises using case examples to assess scoring fidelity, and opportunities to post feedback, questions, and reflections about the process. After ensuring all participants completed the training program, the participants attended a synchronous session via a HIPAA secured Zoom platform to score three video case examples using the OT-PICS tool.

Data analysis

Content validity
Content validity is used to determine the relevance of assessment items in measuring an identified construct through a panel of content experts (Zamanzadeh et al., 2015). Item level content validity (I-CVI) and overall scale level validity (S-CVI) were calculated using the following equations (Murphy et al., 2017):

$$I-CVI = \frac{(n \text{ experts that scored } 3) + (n \text{ experts that scored } 4)}{(\text{total } n \text{ of content experts})}$$

$$S-CVI = \frac{\text{(sum of all } I-CVI \text{ scores})}{(\text{total } n \text{ of scored items})}$$

If the CVI was greater than or equal to 0.80, the item had excellent validity, the item that scored 0.70 indicates a need for revision, and the items that scored lower than 0.50 will be eliminated (Davis, 1992).

In addition to content validity, the researchers calculated multi-rater kappa statistic based on the recommendations of Polit et al. (2007) to consider and adjust for chance agreement probability from use of multiple content experts. To determine the modified kappa ($k$) statistic, the researchers first calculated the probability of chance ($P_c$) statistic to assess the level of agreement beyond chance between multiple raters, using the following equation (Polit et al., 2007):
where $p_c$ is the probability of chance universal agreement on relevance and $N$ is the number of judges.

Once the probability of chance statistic was calculated, the researchers calculated the modified kappa statistic to adjust for potential chance agreement (Zamanzadeh et al., 2015). Inventory items with modified $k$ of above 0.74 were rated excellent, 0.60–0.74 were rated good, and 0.40–0.59 were fair. After considering chance agreement, the modified $k$ statistic should be similar or close to the I-CVI score. The modified $k$ statistic was calculated using the following formula recommended by Wynd et al. (2003):

$$k = \frac{P_o - P_e}{1 - P_e}$$

where $P_o$ indicates the I-CVI of the subscale and $P_e$ indicates the chance of agreement.

**Inter-rater reliability**

Inter-rater reliability is used to measure the degree of agreement among multiple raters (Hallgren, 2012). The intra-class correlation (ICC) is most commonly used to assess inter-rater reliability in studies that use ordinal, interval, and ratio variables. Unlike other measures of inter-rater agreement that examine all or nothing agreement, the ICC examines the magnitude of disagreement, with higher ICC values indicating greater IRR, ranging from 0 (random agreement) to 1.0 (perfect agreement). Inventory items with ICC values <0.40 indicated poor agreement, 0.40–0.59 indicated fair agreement, 0.60–0.74 indicated good agreement, and 0.75–1.0 indicated excellent agreement (Hallgren, 2012). The ICC values for each inventory item was calculated using the following formula recommended by Hallgren (2012):

$$x_{ij} = m + r_i + e_{ij}$$

Where $x_{ij}$ is the rating provided to case example $i$ by participant $j$, is the mean of the true score for variable $X$, $r_i$ is the deviation of the true score from the mean for subject $i$, and $e_{ij}$ is the measurement error.

**Results**

Table 3 provides a summary of the content validity indices of the OT-PICS. The content reviewers indicated that all 15 items of the OT-PICS are essential items to evaluate functional cognition in children as indicated
by an I-CVI of 0.71 or higher and excellent S-CVI findings of 0.96. The modified kappa statistic similarly reflects the results of the I-CVI analysis with consideration and minimization of probability of chance agreement. Overall content validity at the scale level indicated that all scale items are essential to the inventory. The open-ended comment section provided helpful feedback into clarifying the language of the scale, modifying the criteria for items of the inventory, and providing more concrete examples of activities and clarifying directions in the tool manual.

Based on content reviewer comments, two of the five sub-domain categories, Memory and Sequencing, were initially combined and renamed Sequential Memory. One content expert provided insight that a child’s ability to simply recite the instructions for a given task is not the best measure of working memory. The Sequential Memory sub-domain was revised in definition as “the child’s ability to accurately remember the steps of a given task and execute the steps in the appropriate sequence”, to more clearly and appropriately capture working memory and its intersection with sequencing. The Error Detection sub-domain was also revised for clarity of language to Detecting an Error or Challenge, to better encompass a child’s ability to recognize any type of performance breakdown during or after task performance.

Table 4 provides a summary of the intra-class correlation coefficients of the domains of OT-PICS. The OT-PICS tool demonstrates moderate reliability overall, with an inter-rater ICC of 0.63.

Based on the ICC coefficients and the qualitative comments, the Sequential Memory variable was re-parsed out into separate variables of Memory and...
Sequencing. Several of the therapist’s comments indicated the need for more clarity of language in the difference between verbally or gesturally recalling instructions for an activity when prompted, and the process of carrying out an activity in the appropriate sequence. The Memory sub-domain was revised in definition as, “the child’s ability to accurately verbally or gesturally recall the steps of a given task when prompted.” The Sequencing sub-domain was revised in definition as, “the child’s ability to carry out the required steps of a given task in the correct order.”

One therapist provided insight into the difference between a child simply recognizing that there is a problem versus knowing what the specific error is. Therefore, the Detecting an Error or Challenge sub-domain was revised in language to better clarify what is qualified as a child’s task breakdown. Furthermore, the Play subdomain, which had the lowest domain ICC value, was revised based on feedback from therapists to include more structured play-based tasks with rules. The manual was subsequently revised to include instructions for the therapist as, “an age-appropriate game or play task with a structured, well-established set of rules” and included sample play activities such as UNO™, Connect-4™, or Simon Says.

Information gathered from the content experts and practicing occupational therapists supported the development of the OT-PICS as 1) generally easy to understand and use, (2) addresses relevant areas to significant occupational domains in a child’s life, and (3) can potentially be expanded for use in varied settings.

Both the content experts and the therapists indicated that the OT-PICS is a helpful and practical screening tool that can potentially assist in identifying potential persistent cognitive impairments in hospitalized children. Several therapists indicated that the tool manual was easy to understand and the scoring form was easy and clear to follow. Additionally, several practitioners indicated that this screening tool can help with providing objective information to team members to assist with safe discharge planning and help provide additional support for need for therapy services or more in-depth evaluation.

The content experts agreed that the OT-PICS provided an overview of fundamental cognitive skills that are essential for engagement in significant domains of a child’s life. One clinician indicated that as of now, there are

### Table 4. Intraclass correlation coefficients of the OT-PICS.

<table>
<thead>
<tr>
<th>OT-PICS Sub-domain</th>
<th>Intraclass correlation coefficient (ICC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Domains</td>
<td>0.63 (moderate agreement)*</td>
</tr>
<tr>
<td>Play</td>
<td>0.53 (fair agreement)**</td>
</tr>
<tr>
<td>Self-Care</td>
<td>0.67 (moderate agreement)*</td>
</tr>
<tr>
<td>Educational Participation</td>
<td>0.72 (moderate agreement)*</td>
</tr>
</tbody>
</table>

*Significant at p < .05.
**Significant at p < .10.
minimal performance-based tools that target functional cognition for this population, and that this tool can assist with bridging this gap. Furthermore, the therapists indicated that this tool can potentially prove useful in alternate settings (i.e. clinic, schools, private practice), and help identify children who need additional support, provide justification for continued therapy services, as well as help practitioners tailor interventions to target areas of cognitive weakness in children.

**Discussion**

To meet the need to develop assessment tools that examine cognitive skills in contexts relevant to children and their functional level, the *Occupational Therapy Pediatric Inventory of Cognitive Skills* (OT-PICS) was developed. The OT-PICS examines essential elements of functional cognition in critically ill children during observation of active engagement in occupations of childhood. This study analyzed the preliminary content validity and inter-rater reliability of the OT-PICS. Based on feedback from content experts and therapists who administered the tool, the OT-PICS appears to be a promising tool that can potentially aid in assessment of essential elements of functional cognition in children.

Descriptive feedback provided by the raters indicated that the OT-PICS tool was easy to understand and use and indicated that they would likely incorporate this tool into their future practice. Several therapists provided comments related to challenges with scoring the play sub-domain, particularly with regard to understanding how to score elements of functional cognition (i.e. sequential memory and error detection) during more unstructured play based tasks. The therapists provided helpful feedback into clarifying the language of the scale, further modifying the definitions for each of the observed functional cognition variables of the inventory, and clarifying instructions provided in the tool manual.

While the goal of many reliability studies is to attain a high level of inter-rater agreement, a high level of agreement is not always achievable based on the nature of a given assessment tool. Individualized, client-centered assessments, such as the COPM, while widely used in current occupational therapy practice, demonstrate low to moderate reliability, as they are unable to standardize elements of their tool at the expense of eliminating the individualized and client-centered focus of the assessment (Eyssen et al., 2005). Similarly, as the OT-PICS is designed as an ipsative, criterion-based assessment that focuses on child and family chosen activities, it becomes difficult to standardize administration at the expense of losing the client-centeredness, and therefore, the moderate reliability of the tool can be deemed acceptable at this time. Additionally, different
from other outcome measures that aim to measure cognition, the OT-PICS emphasizes the use of child and family chosen activities as the basis of assessment to examine a child’s cognitive skills in the context of occupations that are uniquely meaningful to them, providing a more holistic measure of cognitive strengths and limitations. The gap the OT-PICS aims to address was emphasized by Giles and colleagues when they asserted that “frontline occupational therapists need tests that can be embedded systematically within plans of care across at-risk patient populations to enhance quality of care and drive achievement of desired outcomes” (2020; p. 4)

Limitations
In psychometric assessment, content validity refers to the extent to which a test item represents the desired domain of assessment. One limitation in this process is that the content experts who reviewed the items included in the inventory were not required to administer the tool on an actual child. The participants may have additional insights as a result of administering the inventory. Another limitation is that due to the COVID-19 pandemic, the therapists that administered the OT-PICS tool scored pre-recorded case examples instead of working directly with children in their setting. The therapists would likely have additional insights as a result of directly administering the tool on a child instead of a video case example. Additionally, the content validity study only included seven content experts and the inter-rater reliability study only include nine participants, both recruited via a convenience sample. A larger and more representative sample would be required for future studies.

Application to occupational therapy practice
Qualitative and quantitative findings from the OT-PICS can aid occupational therapists in hospitals and various pediatric settings (i.e. outpatient, school-based, clinics) to address and support children and families in identifying and remediating cognitive impairments, provide caregivers and service providers with an occupation-focused perspective to discuss assessment and intervention planning, provide opportunities to collaborate with interdisciplinary team members on how occupational therapists are uniquely qualified to assess, address, and optimize functional cognition skills in children, as well as identify the need for additional therapy services.
Future research

Future research avenues include the need to establish construct validity and test reliability of the inventory. Future research is also needed to continue expanding on practice guidelines to improve recognition and reframing of cognition within pediatric populations using a function paradigm, as well as develop more assessment and intervention approaches tailored to functional cognition in children.

Summary

This study aimed at providing empirical evidence for initial validity (content) and reliability (inter-rater) of the OT-PICS. More research is needed to determine substantive validity (construct) using more rigorous measurement theories and methods.

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Declaration of Interest

No potential conflict of interest was reported by the authors.

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