The Open Journal of Occupational Therapy

Volume 9
Issue 2 *Spring 2021*

Article 11

April 2021

Functional Cognition in Critically Ill Children: Asserting the Role of Occupational Therapy

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Recommended Citation

Dumas, C. M., & Grajo, L. (2021). Functional Cognition in Critically Ill Children: Asserting the Role of Occupational Therapy. *The Open Journal of Occupational Therapy, 9*(2), 1-9. https://doi.org/10.15453/2168-6408.1793

Functional Cognition in Critically Ill Children: Asserting the Role of Occupational Therapy

Abstract

In this Opinions in the Profession article, we aim to highlight the distinct importance of functional cognition as an assessment and intervention priority in children. In this paper, we use the population of critically-ill children as a specific case example. Functional cognition is the ability of individuals to use and integrate their thinking and processing skills to accomplish desired tasks in their everyday lives in meaningful contexts. We propose three themes through which occupational therapists can assume a more active role in understanding and addressing functional cognition and its impact on occupational performance in critically ill children. Supported by literature, we assert that occupational therapists should: (a) reframe and use the language of functional cognition with a pediatric perspective, (b) use and develop specific assessments to address functional cognition with critically ill children, and (c) include a functional cognition lens during occupation-focused interventions with critically ill children. As the profession of occupational therapy continues to prioritize the practice area of functional cognition, assessment and intervention guidelines will need to be further established and more evidence developed for pediatric specific populations. We urge occupational therapists working with critically ill children to begin to consistently use functional cognition as an essential element in all assessment and intervention planning.

Comments

The authors report no potential conflicts of interest.

Keywords

critically ill children, functional cognition, occupational therapy

Credentials Display

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DOI: 10.15453/2168-6408.1793

Each year, approximately 3 million children are hospitalized for a critical illness in the United States (Witt et al., 2014). Critically ill children are those who experience sudden, acute, and often life-threatening conditions that necessitate hospitalization and admission to the pediatric intensive care unit (Bartel et al., 2000). While the average length of stay for hospitalized children may only be a few days, pediatric survivors often experience medical complications (e.g., sepsis, trauma, respiratory failure, emergent surgical intervention) that increase their risk of prolonged weakness, immobility, and delayed recovery (Cui et al., 2017; Pinto et al., 2017; Pollack et al., 2014). Today, because of medical and technological advancements, children who experience both acute and chronic life-threatening illnesses and injuries have higher rates of survival following hospital admissions. However, pediatric patients often face significant and persistent long-term impairments in all domains of function (Choong et al., 2014; Ebrahim et al., 2013; Fiser et al., 2000).

Following hospital admissions, children can experience moderate to severe physical, global, and cognitive impairments (Choong et al., 2014; Fiser et al., 2000). Physical impairments include muscle weakness or paralyses, while global and cognitive impairments include delayed psychomotor development as well as concentration and behavioral disturbances. Physical and global functional outcomes are more commonly considered throughout recovery, but long-term cognitive impairments following hospitalizations often remain undetected and relatively underexplored in hospitalized children (Choong et al., 2014; Pollack et al., 2014; Pollack et al., 2015).

Specific cognitive limitations may include impairments in sustained attention, problem-solving, planning, memory, self-monitoring, and self-regulation (Bone et al., 2014). These cognitive impairments can present as an inability to use effective information-processing strategies, to self-monitor performance during engagement in occupations, and 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, impairments in cognition are often still present at the time of discharge, contributing to worse overall health outcomes; higher risk for readmission; increased emotional burdens on families; and challenges that influence growth, development, and occupational participation (Bone et al., 2014; Ebrahim et al., 2013; Knoester et al., 2010; Pollack et al., 2015).

Cognitive skills are vital for successful engagement in virtually all daily occupations. In children, cognition plays an essential role in development and influences their ability to learn, retain, and use information to promote successful occupational performance (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 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 and processing skills to accomplish desired tasks in their everyday lives given the totality of their abilities in context (American Occupational Therapy Association [AOTA], 2013). Much of the literature in functional cognition has been framed in the domains of occupational therapy using an adult rehabilitation lens (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. Functional cognition refers to the cognitive skills needed to accomplish the occupations of childhood, including basic activities of daily living (ADLs), play, and productive occupations (e.g., preschool and school readiness skills).

Occupational therapists' holistic perspectives and approaches to health, well-being, adaptation, and participation afford them a distinct role in working with critically ill children. Occupational therapists

are uniquely skilled to evaluate the functional status of critically ill children and understand and address barriers to participation in relation to functional cognition. Occupational therapists are skilled in identifying cognitive deficits through the use of performance-based assessments and developmentally appropriate interventions embedded in occupations that mimic the cognitive demands that children are likely to face after discharge (Cui et al., 2017). Because these approaches are more often nonstandardized or informal in nature, they may not always be formally recognized by members of the interdisciplinary team and, consequently, occupational therapy's vital role in assessment and intervention of functional cognition in children has become part of our "hidden practice" (Giles et al., 2020, p. 2).

In this Opinions in the Profession article, we aim to articulate the distinct value and need for occupational therapists to focus on and establish the profession's role in evaluating and treating functional cognition with respect to critically ill children. We propose three specific themes for occupational therapists working with critically ill children to assume more active roles in addressing functional cognition: (a) reframing our approach to functional cognition specific to children, (b) using and developing occupation-based assessment tools to examine functional cognition in children, and (c) designing occupation-based interventions for children using a functional cognition lens.

Theme 1: Naming and Reframing Functional Cognition in Critically Ill Children

In the last several years, there has been a shift in the occupational therapy profession's emphasis on and advocacy for cognition as a central focus in evaluating an individual's functional performance (AOTA, 2013). In adult clinical practice, functional cognition has become an essential element in evaluating and treating clients to ensure safe discharge planning; optimize participation in communities; and limit the potential for adverse events, medical complications, and hospital readmissions (Champagne et al., 2013; Giles et al., 2020). Occupational therapy literature has become richer in asserting how functional cognition should be framed in adult populations. This naming and framing has aided occupational therapists in defining and addressing functional cognition in adults as the cognitive skills required for clients to safely navigate in their home environments, engage in their desired basic ADLs and IADLs, manage their medical conditions, and actively participate in their communities (AOTA, 2013).

In pediatric practice, cognition has been a domain of function across multiple disciplines. The complexity of cognition as a skill has been addressed from the perspective of learning, motivation, executive functioning, reasoning, and critical thinking by cognitive psychologists, teachers, and special education experts (Welsh et al., 2010); from the perspective of learning and using language, communication, and phonological processing by speech-language pathologists and reading specialists (Marton et al., 2005); and from the perspective of play, behavioral and emotional regulation, and building relationships by child psychologists (Whitebread et al., 2009). One can note that many of these framing of cognition by other disciplines have several intersections (i.e., play, executive functioning, self-regulation) with how cognition as a lens is viewed and approached in occupational therapy practice. How, then, can we frame cognition while articulating the unique and distinct value of occupational therapy? We assert that functional cognition viewed through our occupational lens of participation and engagement is our unique contribution to this emerging body of knowledge.

Functional cognition in critically ill preschool-aged children is a nebulous concept. For school-aged children, functional cognition is closely linked with academics, and the focus of assessment and intervention is related to fostering the skills needed for learning, academic achievement, and school participation. For example, Grajo and Gutman (2019) reframed functional cognition and used the term functional literacy to define the cognitive skills needed to decode and use written information in daily

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DOI: 10.15453/2168-6408.1793

activities. This may be a limited view of functional cognition in children, however, because functional cognition is necessary to engage in all daily occupations of children. In younger children, functional cognition is required to engage in age-appropriate ADLs, social participation, and play (AOTA, 2020). For example, when a preschooler engages in a constructional play activity (e.g., stacking cups, forming puzzles, building a figure from Lego blocks), the child uses various cognitive skills that comprise executive functioning, (i.e., ability to organize, focus, plan, initiate, and problem-solve through active participation). These cognitive skills are embedded in the "doing" of the play activity and serve as the foundational cognitive building blocks that children build on and adapt for later application in learning and school-based environments (Piaget, 2003).

To appropriately understand and address functional cognition in critically ill children, occupational therapists must further define and use a more holistic and encompassing lens of functional cognition in practice. Naming and framing functional cognition specific to critically ill children and their unique daily occupations and not as disparate skills (e.g., sequential memory, motor planning) can aid occupational therapists in understanding and addressing more realistic occupational challenges, thereby ensuring child-centered and family-centered care (Chevignard et al., 2012). For example, viewing a child's skills as they are embedded into performance of a meaningful task (i.e., reciprocal play with peer, lace-tying, or self-dressing) can help occupational therapists reframe and address how these cognitive skills can promote or hinder performance and meaningful engagement in children. Oftentimes in practice, occupational therapists provide many play-based interventions to improve memory skills, sequencing skills, and remembering directions in games without necessarily tying these together with actual occupations children are expected to do. We assert that the address of cognitive skills must be embedded in tasks such as house chores; daily schedules and routines; and school-based tasks, such as completing homework and understanding instructions for worksheets, etc. This naming and framing may also more broadly assert the distinct value and contribution of occupational therapy in addressing cognition in children in general (and not only those who are critically ill), unique from the approaches of the many other professions with whom we work. While the message about the importance of functional cognition in occupational therapy has been clearly stated, methods to identify functional cognition specific to children need to be further outlined. This includes the development of specific functional cognition assessments and intervention approaches centered on occupational participation.

Theme 2: Development and Use of Functional Cognition Assessments

While current literature suggests that pediatric patients who survive critical illness experience prolonged acute and persistent functional impairments that hinder participation, the understanding and formalized assessment of these acquired impairments and their impact on participation during recovery and following discharge remain relatively unexplored outcome measures (Choong et al., 2014; Pollack et al., 2014; Pollack et al., 2015). Nearly all evidence regarding the prevalence and impact of intensive care outcomes are limited to the adult population, with little data available examining functional outcomes among critically ill children (Choong et al., 2014; Cui et al, 2017). In the occupational therapy literature, there are several assessments that address functional participation in critically ill children, but most only examine the aspect of global functioning. These measures (see Table 1) indicate the presence of functional impairments but do not differentiate between the impacted functional and participation domains (Bone et al., 2014; Ebrahim et al., 2013; Ong et al., 2016; Pollack et al., 2014).

Table 1

Assessments Examining Global Functioning in Critically Ill Children

Assessment and Citation	Population and Age Group Intended For	Type of Assessment	Domain of Cognition Assessed
Pediatric Overall Performance Category and Pediatric Cerebral Performance Category (Fiser, 1992)	Critically ill children aged birth–18 years	Qualitative – observational rating scale	Cognitive and overall short-term disability
Modified Glasgow Outcome Scale (Butt et al., 1990)	Pediatric traumatic brain injury patients aged birth–16 years	Qualitative – observational rating scale	Communication
Vineland Adaptive Behavior Scales (VABS – 2) (Sparrow et al., 2005)	Individuals aged birth–90 years	Norm-referenced	Communication and socialization
Functional Status Scale (FSS) (Pollack et al., 2009)	Hospitalized children aged 0–18 years	Qualitative – observational rating scale	Mental status

Although several assessments are available to examine the physical, developmental, behavioral, and psychosocial skills in critically ill children, there is limited availability of assessments and outcome measures to quantify impairments in cognitive domains of function (Aspesberro et al., 2015; Bone et al., 2014; Ebrahim et al., 2013; Pollack et al., 2014). Many cognitive assessments used in current practice are nonstandardized, observational in nature, and exclusively examine cognitive skills in isolation (i.e., attention, memory, executive functioning skills), such as those listed in Table 1. These assessments are helpful in providing information on risk factors and the presence of cognitive impairments but not their implications on occupational performance and participation. In addition, many assessments used in pediatric practice are interprofessional, with other specialists (i.e., psychologists, teachers) administering the tools and occupational therapists applying the results of these assessments to participation. Giles et al. (2020) asserted the need for cognitive assessments that are related to the daily meaningful tasks of children, rather than simply measure acute changes in cognition or examine cognitive functioning at a single point in time (Giles et al., 2020). Rather than rely on the data of other professionals, it is imperative that occupational therapists conduct their own evaluation to examine functional cognition skills through their unique lens of performance and participation. There continues to be a gap in valid and reliable screening tools and performance-based assessments that examine functional cognition. Occupational therapists are uniquely qualified to address this identified gap through their emphasis on functional participation.

In alignment with the American Occupational Therapy Association and American Occupational Therapy Foundation's *Occupational Therapy Research Agenda* (2011), it is imperative that occupational therapists create screening tools and performance-based assessments to assess functional cognition regarding the key occupations of childhood (i.e., play, social participation, ADLs, education). In

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DOI: 10.15453/2168-6408.1793

occupational therapy practice, there continues to be a need to develop and implement the use of multi-modal assessments that examine children's capacities 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).

As a result of a lack of performance-based valid and reliable assessment tools of functional cognition, there is an absence of normative data in relation to functional cognition in critically ill children. Through the development of valid and reliable screening and performance-based assessments of functional cognition, occupational therapists can help to generate normative data regarding essential cognitive skills expected of children in various stages of development and through engagement in various occupations of childhood (i.e., play, social participation, educational participation). Generating this data and supporting widespread use of screening tests and performance-based assessments will allow occupational therapists to develop normative criteria and assist with intervention selection to address areas of cognitive weakness in critically ill children.

As a profession, we must address the lack of functional cognition assessments by training occupational therapy scholars in instrument development and validation. With an increase of occupational therapists completing both clinical and research doctorates, we can be better positioned to have more occupational therapists skilled at developing and validating functional cognition assessments in the context of occupation, particularly for children. Despite the scarcity of existing pediatric specific tools, as well as a potential lack of funding to acquire new assessments and/or provide continuing education opportunities for practitioners in the area of functional cognition, clinicians must begin to use a functional cognition lens during assessment of occupational engagement in children. Even with the use of nonstandardized tasks, cognitive skills must not be assessed in isolation, but rather always in the contexts of a child's occupations (i.e., the everyday activities in which people participate as individuals, families, and communities to occupy time in meaningful and purposeful ways [World Federation of Occupational Therapists, 2012]). Furthermore, if we are to name and frame functional cognition as a distinct value of our profession, then we must document our assessments using a functional cognition paradigm and use the language of functional cognition consistently with colleagues and interdisciplinary team members as well.

Theme 3: The Need to Use a Functional Cognition Lens During Occupation-Based Interventions

To best address cognitive impairments in critically ill children, occupational therapists must shift their ingrained practice of addressing cognition in critically ill children as disparate skills and reframe it as addressing functional cognition in occupation-based interventions. Through this perspective, occupational therapists can begin to generate intervention approaches geared toward and embedded in all essential occupations of childhood, including play, ADLs, and social participation, as opposed to using a narrower intervention approach by addressing isolated cognitive skills or cognitive skills primarily in relation to learning and school participation (Giles et al., 2020).

Two recent comprehensive practice guidelines that summarize several systematic reviews (Cahill & Beisbier, 2020; Clark & Kingsley, 2020) offer various practice guidelines to address cognition and cognitive development in children throughout the lifespan. Table 2 summarizes cognitive interventions that demonstrate strong to moderate and low levels of evidence based on these guidelines. Overall, these effective interventions highlight three key themes. Cognitive interventions that are effective are those that are: (a) embedded in co-occupations (i.e., shared meaningful participation with others such as a parent, caregiver, teacher, or peer), (b) require active and meaningful engagement from the child in contexts (i.e.,

home, schools, communities), and (c) directly relate to occupations (e.g., school, play, leisure, meaningful interactions with others). These support the need to use a functional cognition lens when using evidence-informed and occupation-based interventions.

Table 2

Cognitive Interventions in Children Birth–5 Years and 5–21 Years of Age that Demonstrate High/Moderate and Low Levels of Evidence

Cognition Interventions with Best Level of Evidence (High /Moderate Level)	**Cognition Interventions with Low Level of Evidence**
Early Childhood (Birth–5 years)	
- Early intervention program (home or clinic based) and touch-based interventions to address cognitive delays - Newborn Individualized Developmental Care and Assessment Program (NIDCAP) with focus on parent/child dyads - Early literacy (i.e., reading aloud, learning/writing letters, Early Reading Program) - Individual/group focused developmental, sensory, and play activities in preschoolers - Preschool curricula (i.e., Read it Again-PreK!, REDI, Kids in Transition School Program) - Parent education on importance of regular play with children	- EI computer training programs to enhance executive functioning and nonverbal reasoning - Cognitive-Functional (Cog-Fun) therapist interventions for preschoolers with ADHD - Kindness curriculum for preschoolers
Children and Youth (5–21 years)	
- Occupational skills training - Active engagement in occupation-based daily activities (i.e., self-care routines) to improve functional mobility and occupational participation - Play interventions (i.e., active coaching, modeling, and guided play participation) to promote cognitive skill acquisition and positive engagement in childhood roles - Academic and nonacademic engagement (i.e., peer support and engagement) in occupation-based interventions to improve learning, academic achievement, and successful participation in school - Peer support and engagement - Activities (i.e., literacy, yoga, and handwriting support) and contextual modifications, increase overall school participation, decrease school absences, and promote increased engagement for school-aged children	- Weighted vests for children with ASD to improve school participation - Active video games to increase physical activity - Isolated activities to address cognitive skills (i.e., visual perception, kinesthesis, motor skills) - Animal-assisted activity to address social skills and school participation - Stability balls to enhance on task time - Handwriting programs (i.e., Handwriting Without Tears) to improve prewriting and writing performance

Note. Synthesized from Cahill and Beisbier, 2020, and Clark and Kingsley, 2020.

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DOI: 10.15453/2168-6408.1793

To more comprehensively address functional cognition in critically ill children, occupational therapists should implement these interventions as well as educate caregivers, teachers, parents, and interdisciplinary team members regarding the evidence that supports the use of occupation-based intervention approaches to enhance functional cognition.

Implications for Occupational Therapy

Occupational therapy's valuable role in providing assessments and interventions of functional cognition in critically ill children is not limited to promoting and developing isolated cognitive skills. Functional cognition is necessary to navigate the world and is closely tied to successful occupational engagement and development of childhood roles. Neglecting to formally address functional cognition in critically ill children results in a failure to address a critical client factor that is essential for the promotion of positive development and occupational participation. As a profession, if we are to advocate and emphasize functional cognition as our unique contribution, we must integrate the expertise of occupational therapy scholars, educators, and clinicians. We offer some challenges to them here.

For Occupational Therapy Scholars

To date, no performance and occupation-based screening or assessment tool of functional cognition has been validated for use with critically ill children. As more and more students and occupational therapists are pursuing research and clinical doctorates, we must address this gap by encouraging occupational therapy scholars as well as our academic institutions to develop and validate these tools for practice. Frontline occupational therapists need outcome measures that can be easily embedded and are easy to use in current daily practice to enhance quality of care, inform intervention planning, assist with safe-discharge planning, and serve as support for justification for services for clients.

In addition to ongoing measurement development, occupational therapists must find ways to generate normative or theoretically-guided criterion data to further understand the components that comprise functional cognition in critically ill children. To accomplish this, occupational therapy scholars should partner with interdisciplinary team members and larger health-care system providers to both develop and evaluate assessment tools in the context of broader occupational therapy delivery systems, as well as include functional cognition assessments in documentation practices. This will allow for more systematic collection and analysis of data sets to inform outcomes analysis and develop criteria for intervention planning.

For Occupational Therapy Educators

As functional cognition continues to become a key practice area in the profession, it is crucial that occupational therapy educators highlight the importance of functional cognition as a fundamental component to both assessment and intervention in critically ill children. Functional cognition is vital to successful engagement in essential occupations of childhood (i.e., play, activities of daily living, educational participation) and intimately tied to positive growth and development in critically ill children. We must ensure that future generations of occupational therapists understand the relevance of functional cognition in relation to occupational performance, as well as provide continuing education opportunities for current occupational therapists to shift their focus to this fundamental construct in daily practice. This is essential to the success of naming and framing functional cognition as a unique and distinct contribution from our profession.

For Occupational Therapy Clinicians

As clinicians, we must first become better at recognizing and reframing the construct of functional cognition from a pediatric perspective; support its use in everyday practice; and find and develop

opportunities to educate and disseminate knowledge of the construct to interdisciplinary team members, clients, and caregivers. In addition, occupational therapists should collaborate with occupational therapy scholars and educators to promote a systemic approach to education and implementation of a functional cognition approach to daily practice. Furthermore, to name and frame functional cognition as a unique contribution in our practice, occupational therapists must advocate in their varied practice areas to include functional cognition in documentation practices, as well as document our assessments using a functional cognition paradigm to assist with cementing our fundamental role in addressing functional cognition in critically ill children. Lastly, many of the assertions we made in this opinion paper, supported by literature, are framed on the needs of critically ill children. Our assertions on the need to frame cognition using a function paradigm, the need to develop more functional cognition assessments, and the need to embed functional cognition in occupation-based interventions can also be generalized to children in general.

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