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IMPROVING OCCUPATIONAL ENGAGEMENT FOR CHILDREN WITH EXECUTIVE DYSFUNCTION

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IMPROVING OCCUPATIONAL ENGAGEMENT FOR CHILDREN WITH EXECUTIVE
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APPROVAL PAGE

This scholarly project, submitted by Autumn L. Hopkin in partial fulfillment of the requirement for the Degree of Occupational Therapy Doctorate from the University of North Dakota, has been read by the Faculty Advisor under whom the work has been done and is hereby approved.

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Date

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<div align="center">**PERMISSION**</div>

Title: Improving Occupational Engagement for Children with Executive Dysfunction

Department: Occupational Therapy

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Abstract

A person's ability to successfully perform complex tasks requires a higher level of thinking made possible through the successful use of executive functions. Executive functions develop over time, but typical development begins in early childhood. When children experience interruptions to development, executive dysfunction can inhibit their ability to reach their full occupational potential with play, academics, and social skill development. This scholarly project aims to promote executive function using an evidence-based approach to support occupational therapy practitioners and the children they serve with executive dysfunction.

A literature review guided by the Ecology of Human Performance (EHP) was used to better understand the barriers and supports of those providing occupational therapy services for children with executive dysfunction. The occupational limitations revealed a need for additional practitioner education, intervention ideas to promote executive function, and parent education.

An executive function toolkit was created for entry-level practitioners in the pediatric outpatient setting. The toolkit, *Improving Occupational Engagement for Children with Executive Dysfunction,* provides the practitioner with education materials, assessment and intervention suggestions, and parent education materials.

With improved access to assessment, intervention, and parent education materials on executive function, this author hopes the toolkit will positively impact a child's development, so they experience fewer barriers as they work to reach their occupational goals.

Chapter I

Introduction

Problem/Need

Executive function encompasses higher-level thinking broken down into three categories to include working memory, inhibition, and cognitive flexibility (Cermak & Toglia, 2018). A person requires executive functions to complete a wide range of occupations including academics, play, socialization, activities of daily living, and leisure (Cermak & Toglia, 2018). Many children experience an executive dysfunction that impacts their everyday life. There is a lack of evidence-based interventions provided to support children with executive dysfunction in their various contexts. Research identified that specific education on executive function has not occurred for pediatric occupational therapist (Cramm et al., 2013) Research identified the need to for occupational therapist to specifically assess for and target executive functions (Josman & Meyer, 2019). There is a decrease in research with specific interventions and information, therefore a need for an executive function-based toolkit is supported to be developed and implemented for them.

Purpose/Objectives

The purpose of a program, *improving occupational engagement for children with executive dysfunction,* is to promote participation and engagement in daily life for children experiencing difficulties related to executive dysfunction. The goal of this program will be met through the development of an executive function-based toolkit to support children in a variety of settings. A toolkit is a set of guidelines developed with education and resources to assist with meeting a need (HarperCollins, 2023). This toolkit serves as a guide for occupational therapists

in the pediatric outpatient clinic to target executive function. An understanding of executive

function and its components are provided within the toolkit. The toolkit provides a guide based

on understanding the relation of executive function, person factors, contexts, available tasks, and

the performance range. A layout of interventions for occupational therapist to begin sessions

with clients who experience executive dysfunction are provided as well. Occupational therapists

will then be able to adapt/modify and grade the interventions to meet the needs of the child. The

toolkit also establishes handouts that can be provided to parents. These handouts help to ensure

that the parent understands how executive function may impact their child and the support they

can put in place at home. It is the hope that with this toolkit entry level pediatric occupational

therapist will have an increased understanding of executive function, the ability to use provided

resources to assist with meeting needs of children with executive dysfunction. Through this

product, children could improve in daily occupations that require executive function skills, and

parents could further support their children in the home environment.

Theoretical Framework

The toolkit was developed using the lens of the ecology of human performance (EHP)

model. The EHP model was developed in 1994 by Winnie Dunn (Dunn, 2017). The EHP model

is a person-centered framework. The model focuses on the impact of the person factors,

contextual factors, tasks, and the performance range for an individual. Additionally, it

established intervention types to support the person, including create/promote, establish/restore,

adapt/modify, alter, and prevent (Dunn, 2017).

The person factors are comprised of the individual's past experiences, values, interests,

sensorimotor, cognitive, and psychosocial skills (Dunn, 2017). These factors become an

influence on the tasks an individual chooses to do. Tasks are behaviors and actions that allow an

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individual to accomplish a goal and can be graded to meet the needs of specific individuals (Dunn, 2017). The tasks change depending on the person and the context in which the person experiences them. The contexts can be categorized into temporal, physical, social, and cultural (Dunn, 2017). Individuals experience a variety of differences within these contexts. Performance range is then built based on the dynamic relationship of the context, person, and tasks (Dunn, 2017).

The use of the EHP model best serves the development of this scholarly project and toolkit due to understanding a person factor that can both impact and be impacted by contextual factors and person experiences. For the therapist to utilize interventions to target executive function, they must first understand the dynamic relationship regarding specific individuals. This model also identifies how targeting specific areas of need can increase the available task increasing the performance range.

Conclusion

Chapter II provides an overview of the collected research that guided the toolkit's development and support. This establishes a foundation for understanding executive function and the need for intervention in the pediatric outpatient population. The plan for research and development of the product is provided in Chapter III. This information established the layout for the process of development for the scholarly project. A summary of the product and areas of inclusion is provided in Chapter IV. It refers the reader to the provided appendix for reference of the full product. A summary is included which provides an understanding of the purpose and process of the scholarly project in its entirety in Chapter V.

Key Terms

- **Executive Function -** Higher level thinking of an individual's ability to plan, organize, utilize working memory, manage time,, inhibit actions, and have cognitive flexibility (Cermak & Toglia 2018; Shonkoff et al., 2011).

- **Sensory Processing -** The way in which an individual registers and interprets sensory information in the environment leading to a response (Critz et al., 2015).

- **Occupational Therapy -** Enhancing participation in everyday life occupations for people or groups through therapeutic intervention (American Occupational Therapy Association, 2020).

- **Occupational Therapist -** Individuals responsible for the safety and effectiveness of occupational therapy services (American Occupational Therapy Association, 2020).

- **Pediatric Occupational Therapist –** Occupational therapist who focus on promoting children's engagement and participation in life roles to include play, leisure, productivity in daily activities, and developing independence (Novak & Honan, 2019).

Chapter II

Literature Review

Executive Function

Executive function is the higher-level cognitive process categorized into three domains working memory, cognitive flexibility, and inhibition (Cermak & Toglia, 2018). Executive dysfunction is defined as a wide range of difficulties in organization, planning, shifting attention, sequencing, and time management (Shonkoff et al., 2011; Cermak & Toglia, 2018). Rabinovici et al. (2015) stated that working memory is a person's ability to temporarily store, process, and manipulate information for use. Working memory is crucial in high-level thinking executive function tasks such as organization and planning. Cognitive flexibility focuses on an individual's ability to shift between tasks and adapt to the changes around them (Cermak & Toglia, 2018). Finally, inhibition allows an individual to maintain attention to task, resist impulsive behaviors, and ignore distractions in their environment (Cermak & Toglia, 2018). All three subcategories work together to form the cognitive processes involved in executive function. Executive functions can also be referred to in two categories: hot and cold. A hot executive function most often occurs in motivating and emotional situations. Treatment focuses on impulse control, decision-making, delayed gratification, resisting temptations, socially appropriate responses, and emotional regulation (Cermak & Toglia, 2018). Cold executive functions are those in neutral situations and include skills such as working memory, planning, strategizing, flexibility, and problem-solving (Ardila, 2013; Cermak & Toglia, 2018). When an individual experiences difficulty in these areas, it is referred to as executive dysfunction (Rabinovici et al., 2015).

Executive dysfunction has been found to impact a wide range of children with various neurodevelopmental disabilities. Two of the most common diagnoses associated with executive function difficulties are autism spectrum disorder (ASD) and attention deficit hyperactivity disorder (ADHD). ASD is defined as a developmental disability in which individuals communicate, interact, behave, and learn differently than their typical peers (Centers for Disease Control and Prevention [CDC], 2022c). ADHD is a neurodevelopmental disorder in which individuals struggle with skills, including paying attention, impulsive behaviors, or high activity levels (CDC, 2022b).

Statistics identify the prevalence of executive functioning difficulties within ASD and ADHD. One in 15 children with attention deficit hyperactivity disorder and one in 68 children with autism spectrum disorder experience executive dysfunction (Dajani et al., 2016). According to Holmes (2010), slower processing speed and deficits in working memory are common characteristics of executive dysfunction for children with ASD and ADHD. 15% of children experience problems directly related to deficits in working memory (Holmes, 2010). Oeri et al. (2020) stated that executive dysfunction could relate to maladaptive behaviors that cause difficulty staying focused. Persistence to task focuses on a combination of cognitive skills and the child's temperament which determines whether a child can stay on task or become off task during engagement in various occupations. Those children with better persistence exhibit better inhibitory control and cognitive flexibility. The less persistent children with the various tasks had decreased inhibitory control and cognitive flexibility. (Oeri et al., 2020).

Sensory Processing

Researchers have found a strong correlation between sensory processing and executive function (Brown et al., 2021). Sensory processing disorder is defined as the brain experiencing

concerns with processing incoming sensory stimuli leading to maladaptive responses by children (Camarata et al., 2020; Critz et al., 2015). On average, 5-16% of the population experiences sensory processing disorder. When a child has an additional diagnosis, the difficulty with sensory processing can increase (Miller et al., 2017). According to Dean et al. (2018), children with sensory processing difficulties respond through internalizing or externalizing the incoming stimuli, which can create protective factors. Internalizing relates to experiencing anxiety and/or depression, while externalizing relates more to emotional regulation. How a child responds impacts their engagement in various activities (Dean et al., 2018). Sensory processing is a key component in many areas of life, including school, home, and community. The ability to process the world around them impacts how children respond emotionally, interact with peers, perform skills, and complete everyday occupations (Miller et al., 2017). Executive dysfunction and sensory processing difficulties affect similar areas of a child's life. The sensory processing frame of reference helps to identify areas of concern for those experiencing sensory processing difficulties similar to those with executive function difficulties. The sensory therapies and research focus on different needs that must be met to move to the next level (Miller et al., 2020). At the base, the focus should be on sensation; once this need is met, traveling up the pyramid can occur until you meet functional outcomes, which is executive functioning. Underlying our higher-level functions is sensory processing; this determines that we must meet both sensory and executive function needs to meet our overall goal and achieve improved quality of life (Miller et al., 2020).

Various studies have looked at the relationship between these two diagnoses. Diamant (2021) conducted a study focused on the relationship between executive dysfunction and sensory processing behaviors. An increased reactivity was related to decreased executive function

(Diamant, 2021). The correlation between these two diagnoses also presented with increased impulsivity and reduced attention. Individuals with typical sensory responses also had typical executive function abilities (Diamant, 2021).

According to Pastor-Cerezuela (2020) ASD has been found to include deficits in sensory processing and executive function. They conducted a study to compare children with ASD to those of typical development. The study focused on a child's sensory processing to predict executive function abilities. The study found that sensory processing abilities had excellent predictability for inhibitory control, sustained auditory attention, and short-term verbal memory (Pastor-Cerezuela, 2020). Crasta et al. (2020) found similar results to the previous study. This study compared the results of children with ASD, sensory processing disorder, and typically developing children. In this study, results showed that children with ASD and SPD have more difficulty with sensory processing and attention compared to their typically developing peers. Children with ASD had more difficulty with attention, whereas children with SPD had more difficulty with sensory processing. Despite this difference, they correlated with executive function and sensory processing (Crasta et al., 2020). The prior studies show a relationship between executive function abilities and sensory processing, leading to the need for interventions to address both areas for children.

Executive function and sensory processing difficulties lead to various concerns in many areas of occupation for children. Occupations most impacted for these children are academics, socialization, activities of daily living, and instrumental activities of daily living (American Occupational Therapy Association [AOTA], 2014; Baum & Katz, 2011; Shonkoff et al., 2011). Academics is an occupation that most children participate in every week. When students have difficulty with working memory, they experience problems in the academic setting. Ritter et al.

(2013) found a correlation between reading and working memory, children who had difficulty with reading experienced difficulty with working memory. Working memory ability was also related to children's math performance (Engel de Abreu et al., 2014). Executive function difficulties can be related to future outcomes for children and cause difficulty with new situations and tasks (Romer & Pizzagalli, 2021). Targeting executive function skills early can assist with ensuring better outcomes (Romer & Pizzagalli, 2021). Without support, these children may have lifelong impacts on their day-to-day activities. As an occupational therapist, it is important to facilitate engagement and meaning in life roles for children (Novak & Honan, 2019). To give support, an occupational therapist must have the knowledge required to meet these children's needs.

Population

The pediatric population is a group of individuals aged 0 to 21 years old at the time of diagnosis (U.S. Food and Drug Administration, 2022.). In this developmental time frame, there is a focus on meeting milestones for the child to learn and grow. Milestones for children and infants are categorized into social/emotional, language/communication, cognition, and movement/physical development (Centers for Disease Control and Prevention [CDC], 2020). By the time a child reaches the age of five, they should have met most of these milestones, including taking turns, following rules, writing their name, doing basic chores around the home, and more. It is important to address difficulty meeting milestones early to ensure successful future outcomes for children (CDC, 2022). According to Calderon (2020) and Miller et al. (2017), difficulty with executive function and sensory processing can lead to problems meeting milestones related to emotional regulation, time management in school, and remembering and following instructions.

While there are many theories available in occupational therapy, the theory of change helped to provide an understanding of the need to support individuals who experience problems with both sensory processing and executive function difficulties (Camarate, 2021). In the theory of change, sensory forms the base of the diagram; to impact executive function, you must meet basic sensory needs (Camarate, 2021). To meet these needs, interventions have to be established to support children with executive function and sensory processing difficulties. For this program, interventions target both executive dysfunction and sensory processing.

Interventions for Sensory Processing and Executive Dysfunction

The three main intervention types that have shown improvements for children with executive dysfunction and sensory processing difficulties are environmental adaption, parent and caregiver education, and child-focused interventions (Reynolds et al., 2017). Reynolds et al. (2017) stated that increasing the use of education for parents and caregivers and environmental adaption on top of child-focused interventions can lead to improved outcomes for children, leading to a multifaceted approach to intervention. An additional 40 interventions have also been found to be utilized as treatment for executive dysfunction and sensory processing difficulties. Interventions given the green light to be used were behavioral interventions, bimanual training, parental coaching, and the CAPS program, thus proving that parents and occupational therapist have a wide range of interventions to help meet the needs of children with executive dysfunction and sensory processing concerns (Novak & Honan, 2019). Similar to previous research, computerized and non-computerized tasks are utilized as interventions for executive dysfunction and sensory processing. All interventions were based on concerns identified within testing measures, the two main concerns being working memory and regulation (Takacs & Kassai,

2019). In addition to interventions focused on the person, environmental aspects can also be altered to increase positive outcomes for children with executive dysfunction.

The environment can greatly impact various occupations for children with executive dysfunction and sensory processing difficulties. Children learn and grow on experiences they encounter in their environments. D'Arrigo et al. (2020) found that the interactions children have in the environment can lead to an increase or decrease in attempts for engagement due to the level of safety the child feels. When a child felt safe enough to engage, they improved self-efficacy, motivation, and goal-oriented behaviors. Evaluating the signs of engagement, the feeling of safety experienced by the child, interaction with the therapist, and meaning behind the activity for the child. Those children who were not engaged became more easily distracted by other stimuli within the environment (D'Arrigo et al., 2020).

While some interventions target sensory processing and executive function, in some cases, an intervention is wholly focused on executive function difficulties, specifically a targeted executive function area. As noted prior, working memory is a high-level area of concern regarding executive function difficulties. According to Rowe et al. (2019), working memory interventions that are diverse and take place in the natural contexts of the child have an impact on a variety of areas. An important aspect of this study was to consider the individual's age when utilizing different types of interventions. With younger children, non-computerized tasks may be more efficient than computerized, which helped inform the importance of considering the person and context when deciding interventions (Rowe et al., 2019).

In addition to intervention pertaining to executive function, it is important to also consider programs solely focused on sensory processing difficulties. Sensory integration therapy, specifically multisensory therapy has been researched with the children diagnosed with ASD.

Targeting multisensory systems can develop a foundation for high level function (Camarate et al., 2020). Camarate et al. (2020) found that sensory integration and processing therapy, as a whole, was utilized to remediate skills related to brain processes and sensory integration. Ayres Sensory Integration Theory helps children coordinate their senses engage in occupations within their life (Andelin, 2021).

While interventions can be focused on one specific area or skill, it is important to determine outcomes based on overall performance related to sensory processing and executive function difficulties. An adapt/modify intervention that has been utilized in small samples is the metronome program. The metronome program involves the use of a metronome timer when completing tasks. This program can provide a child with a guide to assist with remaining on task and providing feedback during intervention sessions (Kim et al., 2012). The performance seen on metronome programs in combination with additional interventions shows improvement in areas including reading comprehension, reading fluency, attention, sensory processing, and praxis (Kim et al., 2012; Ritter et al., 2013). While the interactive metronome has shown good results, limited research has been conducted on this intervention.

An additional program that has been used with small samples in research is the Pencil Program for Attention Rehabilitation (PARS), which focuses on sensory processing and executive function difficulties. Nejati (2021) found that in the PARS program, children had improvements in selective attention, sustained attention, working memory, and inhibitory control for children. This program included computerized and non-computerized tasks (Nejati, 2021). The above findings help to provide an overview of interventions that have been used prior to assist kids with executive dysfunction in relation to child-focused interventions.

Parent Education

The next related factor is parent education, in which Schaaf et al. (2015) stated that prior to the start of interventions parent's involvement and understanding in their child's needs can be important. It was found that when parents are involved in the co-development of goals with the occupational therapist, parents were more involved; providing the occupational therapist the opportunity to meet additional needs not identified through traditional examination of the child (Schaaf et al., 2015). On top of collaborating with the parent, it is also important to provide education and strategies for helping their child in the home.

Parent and teacher coaching supported a variety of occupations for children due to the improvement in self-efficacy for the parent or teacher. Coaching helps to establish a parent and teacher understanding of the interventions and further carry through (Miller-Kuhaneck & Watling, 2018). Lin et al. (2018) found that when parents were involved in the therapy sessions for their child, there were improvements in cognition, verbal, gross motor, and fine motor areas. The involvement of parents also helped to create therapy sessions that occurred in the more natural environment for the child. Interventions created for parents can be based on playing in the natural environment. These types of interventions include resources such as DVDs, manuals, and set ups for play dates with typically developing children. The outcomes of these parent-led play interventions increased support and communication of the parent to the child and increased social skills for the child (Wilkes-Gillan et al., 2014). Parents want to have education that gives them knowledge related to interventions and conditions, tips for the parents through this time, and information for services they have access to that may support them (Smith et al., 2015).

Parent education materials provide a reference for parents to use for information they may need when not at the occupational therapy site (Hainsworth & Jacobs, 2020). Parent

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education materials should be developed based on specific best practice guidelines. All parent

education materials produced in the program will allow enough white space around the wording

to avoid overwhelming the reader (Hainsworth & Jacobs, 2020). The provided materials should

be written at a fifth-grade level to encompass individuals with different reading levels (Bastable

et al., 2020). All parent education materials should include ample white space, conversational

style of writing, definitions of words provided, consistent use of information, appropriate font

style, and a large enough font that the general population can easily read them (Bastable et al.,

2020; Hainsworth & Jacobs, 2020).

Interprofessional Approach

There are a variety of disciplines that work with children who may experience executive

dysfunction and or sensory processing difficulties. Often these disciplines address these

difficulties and explain them in relation to ADHD or ASD, although they can occur without a

defined diagnosis. Among those disciplines, doctors play a key role in diagnosis, treatment

through medication, and referral for further additional treatment (The Spectrum, 2022). Pediatric

neuropsychologists' complete evaluations on skills and abilities such as problem solving,

attention, memory, depression, anxiety, etc. (American Academy of Clinical Neuropsychology,

2023). Clinical child psychologists often involve the family in the treatment and care of the

child. They also focus on the child's mental health to determine intervention needs related to

social, emotional, learning, and performance (The Spectrum, 2022). A cognitive behavioral

therapist provides interventions focused on changing the child's behavior through individual or

group interventions (The Spectrum, 2022; American Psychological Association, 2017). Children

may also work with special education teachers to develop skills for success in academics (The

Understood Team, 2014). Additionally, speech-language pathologists can help children with

language and communication difficulties due to diagnosis through interventions focused on skills of speech, language, and communication (The Spectrum, 2022). All professionals have a role in providing treatment for children with executive dysfunction and difficulties related to sensory processing in various settings, from hospitals, homes, to the school. It has been found that it is also important for parents to be taught behavioral training methods to work on with their child alongside the medication the child is prescribed by their medical doctor (Centers for Disease and Prevention [CDC], 2022). Occupational therapy is a discipline that focuses on the occupations a person needs and wants to do in order to improve outcomes and overall quality of life (American Occupational Therapy Association [AOTA], 2020).

Occupational Therapy

Settings

Occupational therapists work in a wide range of settings, including pediatrics, skilled nursing, outpatient, inpatient, rehab, work, etc. (AOTA, 2020) Within each of these settings occupational therapist provided skilled services to individuals at various age ranges to facilitate participation in life.

Occupational Therapy's Role in Executive Dysfunction and Sensory Processing

Occupational therapists work with children with executive dysfunction and sensory processing difficulties in pediatric outpatient clinics through interventions to target difficulties related to the whole person. The occupational therapy process starts by completing evaluations with the child to determine impacted occupations and areas of need (American Occupational Therapy Association [AOTA], 2020). The occupational therapists will also include the family in this evaluation to better understand the whole person. Interventions focus on areas to include

self-regulation, problem-solving, multitasking, and other areas of executive dysfunction (Occupational Therapy Helping Children, 2022). A wide range of interventions can be used and include tools such as goal setting, strategy development, visual schedules, and timers, step by-step breakdowns; games that focus on executive function skills, (Kid Sense, 2022; Occupational Therapy Helping Children, 2022). Occupational therapy interventions help support engagement in occupations for a better quality of life (AOTA, 2020).

Cramm et al. (2016) found that occupational therapists had less knowledge than required to meet the needs of individuals experiencing executive dysfunction. Area of occupation identified as most affected with the diagnosis of executive dysfunction includes academics, socialization, activities of daily living, and instrumental activities of daily living (Baum & Katz, 2011; Shonkoff et al., 2011). According to Josman & Meyer (2019), all terms related to executive dysfunction knowledge lack inclusion. Executive dysfunction requires the use of more specific tools to assist in interventions. Tools should provide education on all terms through resources and continuing education opportunities (Josman & Meyer, 2019). The therapist must obtain all necessary information when evaluating new clients with executive dysfunction. This information should include questions that will help to identify significant areas of executive dysfunction. A focus on organization, planning, decision-making, concentration, and many others (Rabinovici et al., 2015). This information will guide the areas that occupational therapists need to know to initiate an appropriate intervention for the client.

Guiding Occupation-based Model

The ecology of human performance (EHP) model is focused on the dynamic relationship of the person, context, and tasks which form the foundation for the performance range of the individual (Dunn, 2017). Each component of EHP can be broken down further to

help identify categories associated with specific piece of the relationship. The person is comprised of cognitive, sensorimotor, and psychosocial skills and abilities (Dunn, 2017). The context of an individual includes social, physical, temporal, and cultural context (Dunn, 2017). Dunn (2017) has found that the interaction of the context with the person factors can determine the availability of tasks the individual can participate in, known as the performance range. Occupational therapists provide intervention to target both the person and the context to establish skills and abilities for task completion. In doing this they can increase the performance range for the client and allow for increased task participation.

Application of Model to Pediatrics

Pediatric occupational therapy encompasses a wide range of individuals with various disabilities from the ages of 0-21 years old. These individuals have different cognitive levels within a child's range. Children in pediatric occupational therapy experience a range of diagnoses, including executive dysfunction, sensory processing difficulties, delayed development, etc. (Rabinovici et al., 2015; Cermak & Toglia, 2018). This diagnosis can impact the abilities of a child to complete everyday tasks. Children also experience different contexts that impact task availability in their daily lives. Each context can either or limit the availability of tasks for the client. The child's contexts can include the individuals around them and the places they spend time (American Occupational Therapy Association [AOTA], 2014). As an occupational therapist looking at the person and the context can help determine supports and barriers related to the specific tasks an individual currently can and in the future may be able to complete. This determines the performance range. Pediatric occupational therapists provide interventions targeted at the person and context for task completion, increasing the overall performance range.

Occupational Therapy Process

The occupational therapy process is an important when addressing clients in all settings. Occupational therapist should first begin with evaluation of the client (AOTA, 2020). This consist of assessments, observations, and occupational profiles to determine needs. The next step in the process is intervention, in which the occupational therapist utilizes areas of need to develop interventions to target (AOTA, 2020). The occupational therapist then implements the intervention with the client. Following this, outcomes occur which can help to determine progress towards goals. Once outcomes are met the individual can be discharged or transitioned to another place for continued occupational therapy (AOTA, 2020).

Determined Needs

Further support for children with executive dysfunction is needed through additional education and intervention. Outpatient pediatric clinics address the needs of many children, with executive dysfunction. The difficulty with this is that occupational therapist may not have the necessary knowledge to specifically address areas related to executive dysfunction. Additional education and training may be required. Education for parents and caregiver is also important. In order to support the needs of the children it is best to have conversations with those who support them daily. While doing this, it is important to provide any information the parent may not have and tips to help them further support their child's needs. Through interview with pediatric occupational therapist at the site, it has been determined that there is a need to provide additional education to occupational therapist, establish executive function focused intervention in practice, and provide understanding of executive function to parents.

A program will be developed that helps address various needs of children seen in pediatric outpatient with executive dysfunction and sensory processing difficulties. The program will focus on targeting the three subcategories of executive function: working memory, inhibition, and cognitive flexibility (Cermak & Toglia, 2018). Due to the nature of this program, occupational therapist will be able to determine areas for further education in relation to executive dysfunction and sensory processing difficulties. In combination the outcome should increase future success of children seen within the pediatric outpatient clinic setting.

Chapter III

Methodology

The development of the executive function toolkit *Improving Occupational Performance for Children with Executive Dysfunction* was created through an in-depth literature review of need, interventions, and statistics. The literature review aimed to determine various difficulties related to executive dysfunction including sensory processing, academics, social skills, activities of daily living, and more. The information gathered in the literature review also provided insight into current interventions utilized to support children with executive dysfunction and determine current intervention gaps. Inspiration for this topic came from the author's interest in ensuring productive engagement in life for children with executive dysfunction in a variety of settings. Executive dysfunction occurs with many additional diagnoses, making it more prevalent. The program was built to specifically address executive function understanding of entry-level practitioners, provide base interventions to get the practitioner started on interventions, and provide parent education handouts for at home implementation and understanding.

A thorough literature review was collected using sources from published books, online resources, evidence-based research, and discussion with experts in the field. The literature review process consisted of collecting articles and information from various sources, including PubMed, CINAHL complete, Science direct, AOTA, CDC, google scholar, and the UND occupational therapy commons. Keywords and phrases included "Outpatient pediatric clinic", "Pediatrics", "Sensory AND children", "Sensory AND pediatrics", "Policies AND outpatient pediatrics", "executive function", "executive function AND sensory AND children". Inclusion criteria for this research included identified gaps for children, peer-reviewed articles, research-

based developmental milestones, policies, and legislation specifically affecting funding and delivery of outpatient pediatrics, and articles or research-based databases focused on executive function and sensory processing. Articles were excluded if they did not fit the population, non-evidence based, older than 10 years, not focused on sensory or executive function. Following the collection of literature, interviews were conducted with an occupational therapist at the site to help identify most common areas of concern with specific site clients.

After completing the literature review, observation, assessments, and consultation with my site mentor was utilized to identify the specific needs of children with executive dysfunction at the pediatric outpatient clinic. These forms of information provided specific details that determined the main areas of focus for the product would be targeting sequencing, planning, and working memory to assist individuals with executive dysfunction in their daily life. It was also determined that sensory processing difficulties often played a role alongside children with executive dysfunction at the site.

The needs assessment was performed to determine the needs of pediatric occupational therapist in addressing executive dysfunction. Based on the information collected, a variety of needs were determined. This included additional education for parents and occupational therapists on executive dysfunction and interventions to specifically address executive dysfunction for children in the pediatric outpatient population.

The product was developed based on collaboration with an occupational therapist at an outpatient pediatric clinic and through completion of a thorough literature search related to executive function and sensory processing. Through this process, it was determined that an executive function-based toolkit would greatly benefit the pediatric population. Specifically, it was determined that the pediatric outpatient clinic would benefit from the use of education on

executive function and sensory processing, interventions to support executive function and

sensory processing, and parent education guides that could be provided to parents and caregivers

to assist with understanding and implementation at home. Only interventions meant for the

pediatric population were included within this toolkit. This toolkit does focus on specific

cognitive milestones and may not be usable with children of all levels of executive function.

Parent education materials were built to be understandable by individuals with a wide range of

education levels. They also provide a basic understanding to the parents of executive function

and the concerns interventions will address.

Occupational Therapy Process

Throughout development of this product EHP will be considered during the occupational

therapy process. The occupational therapy process begins with evaluation of the client.

Evaluation includes an occupational profile which can provide information related to priorities,

beliefs, history of tasks, contextual factors, etc. (AOTA, 2020). An important aspect of this

evaluation is determining the priorities of the client. The tasks an individual prioritizes are

essential for overall quality of life and well-being for the individual (AOTA, 2020). The next

step in the occupational therapy process involves providing assessment of the child that looks at

the whole person. Based on information gathered through interview and assessment, the

occupational therapist can determine the needs to be met and develop a plan of care for the

client. While developing this plan, the occupational therapist can first consider the contextual

supports they currently have in place and contexts that could be improved through intervention

(AOTA, 2020). The occupational therapist takes the data from the intervention plan to establish

best practice interventions. OTPs utilize their occupational analysis skills to find the best

intervention fits and improve engagement in occupations (AOTA, 2020). As clients progress

they can be re-evaluated to determine progress and establish additional goals. Executive function is an area where new goal development can be established on to new and current clients. With EHP the contexts and the person factors come together to further determine the tasks a child is involved in. It helps to identify areas where performance range can be increased through targeted intervention (Dunn et al., 1994). Once a child has met all goals and no new goals need to be established, they can be discharged to continue on in their life and become successful adults in the future.

The methodology section provided information regarding the layout of the toolkit and process for development to assist therapists working with children who have executive function difficulties and sensory processing concerns to have their needs further met. The product was developed ethically with consideration for all individuals seen at pediatric facilities with a need for executive function intervention.

Chapter IV

Product

Chapter 4 introduces the reader to a toolkit that provides the entry-level pediatric occupational therapy practitioner with information, resources, and interventions that can be easily used to target executive dysfunction. The toolkit focuses on subcategories of executive dysfunction, including working memory, cognitive flexibility, and inhibition (Cermak & Toglia, 2018). It was found that executive dysfunction is often comorbid with other diagnoses, including autism spectrum disorder, sensory processing disorder, and attention deficit hyperactivity disorder (Dajani et al., 2016; Simal et al., 2020). Significant research exists on the impact that executive dysfunction has on everyday life. It impacts a wide range of occupations to include activities of daily living, instrumental activities of daily living, academics, and socialization (Baum & Katz, 2011; Shonkoff et al., 2011).

The toolkit *Improving Occupational Engagement for Children with Executive Dysfunction* is organized in the following manner. The program first explains executive function skills expected to be seen throughout the pediatric population as they age. This is followed by understanding assessments and goal development related to executive dysfunction. It is then followed by interventions the occupational therapist can use to begin targeting each client's specific executive function needs. The program additionally provides resources for the occupational therapist to provide to parents to ensure follow through and understanding of executive functioning skills. Through the use of this toolkit, it is hoped that there will be an improvement in executive functioning skills for children in order to further support them in engagement with daily occupations. Below a chart is provided that breaks down EHP approaches to intervention.

The development of this program was supported by the ecology of human performance (EHP) model. EHP provides common terminology including person, environment, task, and performance range (Dunn, 2017). Through these terms the dynamic is more easily understood by the general population. program's focus is based on the contexts in which children live and their characteristics as the person to determine the tasks they participate in. One of the many person factors impacting the ability to perform tasks for the individual is executive functioning skills and abilities. The larger the performance range, the more tasks the individual can complete. To increase this range for children we can utilize the five types of interventions including establish/restore, create, adapt/modify, prevent, and alter (Dunn, 2017).

Table 1

EHP Intervention Approach	Application
Establish/Restore Definition: Improves a person's skills and abilities through targeting the person factors (Dunn, 2017).	Examples: • Sequencing practice charts • Movement interventions • Story development
Alter Definition: Focuses on changing the context so that it is a best match based on the person's needs (Dunn, 2017).	Examples: • Parent handouts with education on altering the environment to support success in occupation.
Adapt/Modify Definition: Making changes to aspects of the context or the task in order to better support a client in completing tasks (Dunn, 2017).	Examples: • Use of visual schedule to assist with organization of occupations. • Modify the environment to reduce barriers and increase performance range.
Prevent	Examples:

Definition: Focused on changing the person factors, context, or tasks to prevent the occurrence of performance problems or negative outcomes (Dunn, 2017).	• Rule establishment for safe engagement in occupations; instruction in safe movement patterns for safety.
Create Definition: Development of circumstances that assist with successful completion. This is done with the assumption that no problem exists or will soon exist (Dunn, 2017).	Examples: • Utilizing all interventions without assumption that disability exist. All interventions can still be beneficial for children.

This toolkit has been developed through evidence-based research focused on executive function. This toolkit serves as a resource to be utilized by entry-level occupational therapists in pediatric outpatient clinics to increase the performance range of children through targeting executive functioning ability. The entirety of the toolkit can be located in Appendix A.

Chapter V

Summary

Project Overview

Research has found that sensory processing and executive dysfunction may co-occur, leading to concerns with engagement in various occupations, including play, academics, socialization, and daily activities (Cermak & Toglia, 2018; Novak & Honan, 2019). While sensory processing has been widely researched and understood by pediatric occupational therapists, executive function is an area in which executive function does not have the same emphasis on gaining knowledge (Cramm et al., 2013). Providing additional information for entry-level practitioners on executive dysfunction, assessments for executive function, intervention ideas, and parent education materials, would allow for increased confidence in treating (Cramm et al., 2013; Lin et al., 2018; Miller-Kuhanek & Watling, 2018; Takacs & Kassai, 2019). The toolkit *Improving Occupational Engagement for Children with Executive Dysfunction* is a product developed to provide education for entry-level pediatric occupational therapist to assist with assessment and intervention for executive dysfunction. All materials developed as part of the toolkit were guided by the ecology of human performance (EHP) model (Dunn, 2017).

Implication for Occupational Therapy Practice

It is intended that this product will help to address the gaps in education and intervention of executive dysfunction for pediatric occupational therapist. Currently, there are limited toolkits available focused on education, assessment, and intervention of executive dysfunction. Additionally, executive function is an area of practice that often is not as studied in pediatric

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occupational therapy due to the high focus on sensory and physical difficulties within the outpatient setting. It is the intention that this product will help bridge the connection between sensory, physical abilities, and executive function for practitioners to understand more aspects of the client and create individualized plans that target all needs.

Implementation

This product will be provided as an open access material through the University of North Dakota scholarly commons. It is intended that providing free access to this product will allow more pediatric occupational therapist to incorporate a focus on executive dysfunction in their clinic setting. The toolkit does provide interventions targeted at children with between specific cognitive levels; however, all interventions can be graded up or down to meet the child's specific needs.

Strengths and Limitations

Strengths of the product include: The product was established to assist with education for entry-level occupational therapy practitioners on executive dysfunction, the relationship that sensory processing and executive function have within a person, understanding of current assessments for sensory processing and executive function, establishment of goals specific to executive function, and a basis for parent education materials to increase at home follow through. This product has been developed using a thorough literature review and the guidance of the ecology of human performance (EHP) model. This product was made to ensure that entry-level practitioners in pediatric occupational therapy could immediately begin understanding and addressing the needs of children who experience executive dysfunction. All education materials were written following best practice guidelines.

The limitations of the product include research has not been conducted on the effectiveness of this product due to recent development of the product. The toolkit does not focus on the general population's needs as it is targeted at entry-level practitioners in pediatric occupational therapy who work with children that experience executive dysfunction. Interventions within the toolkit are also established to meet the needs of children who have met minimum cognitive milestones of holding 2 step directions in mind, have a beginning ability of shifting actions according to changes, and have inhibitory control for at least 4-5 minutes. At maximum these children will meet the cognitive milestones of recalling 5 items in order, ability to follow some rules, and increased adaption to changes. Therefore, the product will have to be adapted to meet the needs of clients outside this range.

Recommendations

It is recommended that this product be utilized to assist with understanding, assessment, and intervention for executive dysfunction in the pediatric outpatient setting. The utilization of additional assessments and intervention may be warranted to ensure that the pediatric occupational therapist is focused on assessing the whole person. It is also recommended that in the future, outcome measures be established to determine the effectiveness of provided materials to create evidence for use in the pediatric outpatient setting.

In the future it is the hope that other students or pediatric occupational therapist will build on to the toolkit to address the specified population's additional needs and increase use with a broader range of cognitive levels relative to executive dysfunction.. This will help to create assessments and handouts that can support most individuals seen within the pediatric outpatient occupational therapy setting.

Conclusion

The toolkit *Improving Occupational Engagement for Children with Executive Dysfunction* is an entry-level pediatric occupational therapist guide to understanding and addressing needs for children with executive dysfunction. It is intended that with this toolkit, entry-level pediatric occupational therapists ensure that executive dysfunction is addressed equally to that of other concerns in the pediatric clinic.. Entry-level pediatric occupational therapists ensure that executive dysfunction is addressed equally to sensory and physical concerns. The toolkit will provide the foundation required to begin working with clients who experience executive dysfunction immediately.

References

American Academy of Clinical Neuropsychology. (2023). Pediatric neuropsychology.

https://theaacn.org/pediatric-neuropsychology/

American Occupational Therapy Association. (2020). Occupational therapy practice framework:

Domain and process (4th ed.). *American Journal of Occupational Therapy, 74*(Suppl. 2),

7412410010. https://doi. org/10.5014/ajot.2020.74S2001

American Occupational Therapy Association. (2014). Occupational therapy's role with children

and youth. [Fact Sheet].

https://www.aota.org/~/media/Corporate/Files/AboutOT/Professionals/WhatIsOT/CY/Fa

ct-Sheets/Children%20and%20Youth%20fact%20sheet.ashx

American Psychological Association. (2017). What is cognitive behavioral therapy?

https://www.apa.org/ptsd-guideline/patients-and-families/cognitive-behavioral

Andelin, L., Reynolds, S., & Schoen, S. (2021). Effectiveness of occupational therapy using a

sensory integration approach: A Multiple-Baseline Design Study. *The American Journal

of Occupational Therapy: Official Publication of the American Occupational Therapy

Association*, *75*(6), 7506205030. https://doi.org/10.5014/ajot.2021.044917

Ardila, A. (2013). Development of metacognitive and emotional executive functions in children.

Applied Neuropsychology: Child, *2*(2), 82–87.

https://doi.org/10.1080/21622965.2013.748388

Bastable, S. B., Myers, G. M., & Binion, B. N. (2020). Literacy in the adult client population. In

S. B. Bastable, P. R. Gramet., D. L. Sopezyk., K. Jacobs, & M. M. Braungart (Eds.),

Health professional as educator: principles of teaching and learning. (2nd ed. pp 283-

346). Jones & Bartlett Learning.

Baum, C. M., & Katz, N. (2011). Introduction to the special issue on cognition and executive

function. *OTJR: Occupation, Participation and Health*, *31*(1), S2.

https://doi.org/10.3928/15394492-20101108-01

Brown, T., Swayn, E., & Pérez Mármol, J. M. (2021). The Relationship between children's

sensory processing and executive functions: An exploratory study. *Journal of

Occupational Therapy, Schools, & Early Intervention*, *14*(3), 307–324.

https://doi.org/10.1080/19411243.2021.1875386

Calderon, J. (2020, December 16). *Executive function in children: Why it matters and how to

help*. Harvard Health. https://www.health.harvard.edu/blog/executive-function-in-

children-why-it-matters-and-how-to-help-2020121621583

Camarata, S., Miller, L. J., & Wallace, M. T. (2020). Evaluating sensory integration/sensory

processing treatment: Issues and analysis. *Frontiers in Integrative Neuroscience*, *14*,

556660. https://doi.org/10.3389/fnint.2020.556660

Centers for Disease Control and Prevention [CDC]. (2022a). CDC's developmental milestones.

Retrieved from https://www.cdc.gov/ncbddd/actearly/milestones/index.html

Centers for Disease Control and Prevention [CDC]. (2022b). What is ADHD? Retrieved from

https://www.cdc.gov/ncbddd/adhd/facts.html

Centers for Disease Control and Prevention [CDC]. (2022c). What is autism spectrum Retrieved

from

https://www.cdc.gov/ncbddd/autism/facts.html#:~:text=Autism%20spectrum%20disorder%20(ASD)%20is,causes%20are%20not%20yet%20known.

Cermak, S. A., & Toglia, J. (2018). Cognitive development across the lifespan: Development of cognition and executive functioning in children and adolescents. In N. Katz, & J. Toglia (Eds), *Cognition, occupation, and participation across the lifespan.* (4th ed., pp 9-28). AOTA Press.

Cramm, H., Krupa, T., Missiuna, C., Lysaght, R. M., & Parker, K. C. H. (2013). Broadening the occupational therapy toolkit: An executive functioning lens for occupational therapy with children and youth. *The American Journal of Occupational Therapy: Official Publication of the American Occupational Therapy Association*, *67*(6), e139-147. https://doi.org/10.5014/ajot.2013.008607

Crasta, J. E., Salzinger, E., Lin, M.-H., Gavin, W. J., & Davies, P. L. (2020). Sensory processing and attention profiles among children with sensory processing disorders and autism spectrum disorders. *Frontiers in Integrative Neuroscience*, *14*, 22. https://doi.org/10.3389/fnint.2020.00022

Critz, C., Blake, K., & Nogueira, E. (2015). Sensory Processing Challenges in Children. *The Journal for Nurse Practitioners*, *11*(7), 710–716. https://doi.org/10.1016/j.nurpra.2015.04.016

Dajani, D. R., Llabre, M. M., Nebel, M. B., Mostofsky, S. H., & Uddin, L. Q. (2016). Heterogeneity of executive functions among comorbid neurodevelopmental disorders. *Scientific Reports*, *6*, 36566. https://doi.org/10.1038/srep36566

D'Arrigo, R. G., Copley, J. A., Poulsen, A. A., & Ziviani, J. (2020). The engaged child in

    occupational therapy. *Canadian Journal of Occupational Therapy. Revue Canadienne*

    D'ergotherapie, *87*(2), 127–136. https://doi.org/10.1177/0008417420905708

Dean, E. E., Little, L., Tomchek, S., & Dunn, W. (2018). Sensory processing in the general

    population: Adaptability, resiliency, and challenging behavior. *The American Journal of*

    Occupational Therapy: Official Publication of the American Occupational Therapy

    Association, *72*(1), 7201195060p1-7201195060p8.

    https://doi.org/10.5014/ajot.2018.019919

Diamant, R., Ruiz, H., & Holmes, K. (2020). Relationships between sensory processing

    behaviors, executive function, and temperament characteristics for effortful control in

    school-age children. *The American Journal of Occupational Therapy*,

    74(4_Supplement_1), 7411505237p1. https://doi.org/10.5014/ajot.2020.74S1-PO9119

Dunn, W., Brown, C., & McGuigan, A. (1994). The ecology of human performance: A

    framework for considering the effect of context. *The American Journal of Occupational*

    Therapy, *48*(7), 595–607. https://doi.org/10.5014/ajot.48.7.595

Dunn, W. (2017). The ecological model of occupation. In J. Hinojosa, P. Kramer, & C. B.

    Royeen (Eds), *Perspectives on human occupation: Theories underlying practice.* (2nd ed.,

    pp 207-235). F.A. Davis Company.

Engel de Abreu, P. M. J., Abreu, N., Nikaedo, C. C., Puglisi, M. L., Tourinho, C. J., Miranda, M.

    C., Befi-Lopes, D. M., Bueno, O. F. A., & Martin, R. (2014). Executive functioning and

    reading achievement in school: A study of Brazilian children assessed by their teachers as

"poor readers." *Frontiers in Psychology*, *5*, 550.
https://doi.org/10.3389/fpsyg.2014.00550

Galiana-Simal, A., Vela-Romero, M., Romero-Vela, V. M., Oliver-Tercero, N., García-Olmo,
V., Benito-Castellanos, P. J., Muñoz-Martinez, V., & Beato-Fernandez, L. (2020).
Sensory processing disorder: Key points of a frequent alteration in neurodevelopmental
disorders. *Cogent Medicine*, *7*(1), 1736829.
https://doi.org/10.1080/2331205X.2020.1736829

Hainsworth, D., & Jacobs, K. (2020). Instructional materials. In S. B. Bastable, P. R. Gramet., D.
L. Sopezyk., K. Jacobs, & M. M. Braungart (Eds.), *Health professional as educator:
principles of teaching and learning.* (2nd ed. pp 185-237). Jones & Bartlett Learning.

HarperCollins. (2023). Toolkit. In *Collins English Dictionary* (8th ed.).

Holmes, J., Gathercole, S. E., & Dunning, D. L. (2010). Chapter 1 - Poor working memory:
Impact and interventions. In J. Holmes (Ed.), *Advances in Child Development and
Behavior* (Vol. 39, pp. 1–43). JAI. https://doi.org/10.1016/B978-0-12-374748-8.00001-9

Josman, N., & Meyer, S. (2019). Conceptualisation and use of executive functions in paediatrics:
A scoping review of occupational therapy literature. *Australian Occupational Therapy
Journal*, *66*(1), 77–90. https://doi.org/10.1111/1440-1630.12525

Kids Sense. (2022). *Executive functioning.* https://childdevelopment.com.au/areas-of-
concern/organisation/executive-functioning/

Kim, H. H., Bo, G. H., & Yoo, B. K. (2012). The effects of a sensory integration programme
with applied interactive metronome training for children with developmental disabilities:

A pilot study. *Hong Kong Journal of Occupational Therapy*, *22*(1), 25–30.

https://doi.org/10.1016/j.hkjot.2012.05.001

Lin, C.-L., Lin, C.-K., & Yu, J.-J. (2018). The effectiveness of parent participation in

occupational therapy for children with developmental delay. *Neuropsychiatric Disease

and Treatment*, *14*, 623–630. https://doi.org/10.2147/NDT.S158688

Miller, L. J., Schoen, S. A., Mulligan, S., & Sullivan, J. (2017). Identification of sensory

processing and integration symptom clusters: A preliminary study. *Occupational Therapy

International*, *2017*, 2876080. https://doi.org/10.1155/2017/2876080

Miller, L.J., Schoen, S.A., & Spielman, V. (2020). A frame of reference for sensory processing

difficulties: Sensory therapies and research (STAR). In P. Kramer J. Hinojosa, & T.

Howe (Eds.). *Frames of reference for pediatric occupational therapy* (4th ed. pp. 159-

204). Lippincott Williams & Wilkins.

Miller-Kuhaneck, H., & Watling, R. (2018). Parental or teacher education and coaching to

support function and participation of children and youth with sensory processing and

sensory integration challenges: A systematic review. *The American Journal of

Occupational Therapy: Official Publication of the American Occupational Therapy

Association*, *72*(1), 7201190030p1-7201190030p11.

https://doi.org/10.5014/ajot.2018.029017

National Center for Learning Disabilities. (2008). *Executive function fact sheet*. LD Online.

https://www.ldonline.org/ld-topics/teaching-instruction/executive-function-fact-

sheet?fbclid=IwAR0P9rFES5C9XCnuajWtx5kp0h96VFyJf4KoUAKmc8mIOQgHDJciI

Fwn7EU

Nejati, V. (2021). Program for attention rehabilitation and strengthening (PARS) improves

    executive functions in children with attention deficit- hyperactivity disorder (ADHD).

    Research in Developmental Disabilities, *113*, 103937.

    https://doi.org/10.1016/j.ridd.2021.103937

Novak, I., & Honan, I. (2019). Effectiveness of paediatric occupational therapy for children with

    disabilities: A systematic review. *Australian Occupational Therapy Journal*, *66*(3), 258–

    273. https://doi.org/10.1111/1440-1630.12573

Occupational Therapy Helping Children, (2022). *ADHD and executive functioning: How*

    occupational therapy can help your child's executive functioning.

    https://occupationaltherapy.com.au/how-occupational-therapy-can-help-your-childs-

    executive-functioning/

Oeri, N., Kälin, S., & Buttelmann, D. (2020). The role of executive functions in kindergarteners'

    persistent and non-persistent behaviour. *British Journal of Developmental Psychology*,

    38(2), 337–343. https://doi.org/10.1111/bjdp.12317

Pastor-Cerezuela, G., Fernández-Andrés, M.-I., Sanz-Cervera, P., & Marín-Suelves, D. (2020).

    The impact of sensory processing on executive and cognitive functions in children with

    autism spectrum disorder in the school context. *Research in Developmental Disabilities*,

    96, 103540. https://doi.org/10.1016/j.ridd.2019.103540

Rabinovici, G. D., Stephens, M. L., & Possin, K. L. (2015). Executive dysfunction. *Continuum :*

    Lifelong Learning in Neurology, *21*(3 Behavioral Neurology and Neuropsychiatry), 646–

    659. https://doi.org/10.1212/01.CON.0000466658.05156.54

Reynolds, S., Glennon, T. J., Ausderau, K., Bendixen, R. M., Kuhaneck, H. M., Pfeiffer, B.,

    Watling, R., Wilkinson, K., & Bodison, S. C. (2017). Using a multifaceted approach to

    working with children who have differences in sensory processing and integration. *The*

    American Journal of Occupational Therapy, *71*(2), 7102360010p1-7102360010p10.

    https://doi.org/10.5014/ajot.2017.019281

Ritter, M., Colson, K. A., & Park, J. (2013). Reading intervention using interactive metronome in

    children with language and reading impairment: A preliminary investigation.

    Communication Disorders Quarterly, *34*(2), 106–119.

    https://doi.org/10.1177/1525740112456422

Romer, A. L., & Pizzagalli, D. A. (2021). Is executive dysfunction a risk marker or consequence

    of psychopathology? A test of executive function as a prospective predictor and outcome

    of general psychopathology in the adolescent brain cognitive development study®.

    Developmental Cognitive Neuroscience, *51*, 100994.

    https://doi.org/10.1016/j.dcn.2021.100994

Rowe, A., Titterington, J., Holmes, J., Henry, L., & Taggart, L. (2019). Interventions targeting

    working memory in 4–11 -year-olds within their everyday contexts: A systematic

    review. *Developmental Review*, *52*, 1–23. https://doi.org/10.1016/j.dr.2019.02.001

Schaaf, R. C., Cohn, E. S., Burke, J., Dumont, R., Miller, A., & Mailloux, Z. (2015). Linking

    sensory factors to participation: Establishing intervention goals with parents for children

    with autism spectrum disorder. *The American Journal of Occupational Therapy: Official*

    Publication of the American Occupational Therapy Association, *69*(5), 6905185005.

    https://doi.org/10.5014/ajot.2015.018036

Shaffer, R. J., Jacokes, L. E., Cassily, J. F., Greenspan, S. I., Tuchman, R. F., & Stemmer, P. J.

    (2001). Effect of interactive metronome training on children with ADHD. *The American*

    Journal of Occupational Therapy, *55*(2), 155–162. https://doi.org/10.5014/ajot.55.2.155

Shonkoff, J. P., Duncan, G. J., Fisher, P. A., Magnuson, K. & Raver, C. (2011). Building the

    brain's 'air traffic control' system: How early experiences shape the development of

    executive function (Working Paper No. 11). Harvard University Center on the

    Developing Child. Retrieved from http://www.developingchild.harvard.edu

Smith, J., Cheater, F., & Bekker, H. (2015). Parents' experiences of living with a child with a

    long-term condition: A rapid structured review of the literature. *Health Expectations: An*

    International Journal of Public Participation in Health Care and Health Policy, *18*(4),

    452–474. https://doi.org/10.1111/hex.12040

Takacs, Z. K., & Kassai, R. (2019). The efficacy of different interventions to foster children's

    executive function skills: A series of meta-analyses. *Psychological Bulletin*, *145*(7), 653–

    697. https://doi.org/10.1037/bul0000195

The Spectrum. (2022). Support professionals for people with Autism. Retrieved from

    https://thespectrum.org.au/autism-support-services/professionals/

The Understood Team. (2014) *Different professionals who help kids with ADHD.* Retrieved from

    https://www.understood.org/en/articles/different-professionals-who-help-kids-with-adhd

U.S. Food and Drug Administration. (2022, April 26). Pediatric medical devices.

    https://www.fda.gov/medical-devices/products-and-medical-procedures/pediatric-

    medical-

devices#:~:text=The%20Federal%20Food%2C%20Drug%2C%20and,first%2028%20da
ys%20of%20life

Wilkes-Gillan, S., Bundy, A., Cordier, R., & Lincoln, M. (2014). Evaluation of a pilot parent-
delivered play-based intervention for children with attention deficit hyperactivity
disorder. *The American Journal of Occupational Therapy: Official Publication of the
American Occupational Therapy Association*, *68*(6), 700–709.
https://doi.org/10.5014/ajot.2014.012450

Zimmer, M., & Desch, L. (2012). Sensory integration therapies for children with developmental
and behavioral disorders. *Pediatrics*, *129*(6), 1186–1189.
https://doi.org/10.1542/peds.2012-0876

Appendix A:

Improving Occupational Engagement for Children with Executive Dysfunction
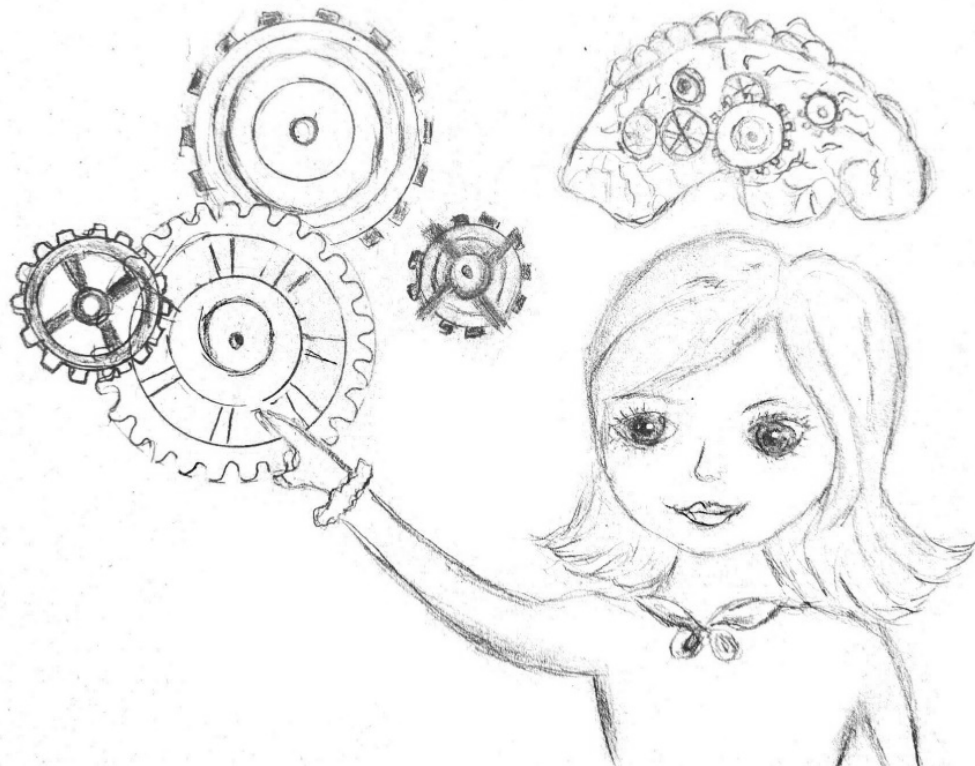
Autumn Hopkin, OTDS

University of North Dakota, Occupational Therapy Department

Section 1:
Introduction to the Manual

Introduction

The toolkit *Improving Occupational Engagement for Children with Executive Dysfunction* focuses on helping entry level practitioners in pediatric clinics understand executive function, its relationship to sensory processing, and began intervention to increase occupational participation for children with concerns in the identified area. This toolkit helps to provide an understanding of the ways in which executive function impacts everyday tasks for children. The toolkit was developed using the Ecology of Human Performance (EHP) model, which focuses on the dynamic relationship of the person, context, tasks, and performance range. Within the toolkit pediatric occupational therapist are provided with a breakdown of executive function in relation to the theoretical framework, understanding of assessments for executive function, goal building, intervention examples, and parent education handouts that will assist with targeting executive function in the clinic and home environments.

Theoretical Framework

The Ecology of Human Performance (EHP) Model was used as the guide for the development of this toolkit. The EHP model was developed by Winnie Dunn in 1994 for the purpose of providing a guiding model on the relationship of various occupational therapy centered domains for practice (Dunn, 1994). According to Dunn (2017) the EHP model helps therapist focus on the relationship between the person, context, and task to provide a performance range for the specified individual. Each individual has different skills and abilities, tasks, and contexts which impact the outcome of performance. Determining the needs to be met for each individual requires the understanding of all three areas impacting performance range.

The EHP model identifies person factors with consideration for the psychosocial, cognitive, and sensorimotor abilities of the individual (Dunn, 2017). These areas establish skills and abilities directly related to the person. Contextual factors provide consideration for the context in the areas of social, temporal, physical, and cultural (Dunn, 2017). Both the person and contextual factors impact the tasks a person is able to engage in. These areas of focus determine the number of tasks available to a person, there for determining the performance range. As the child changes their performance range will also change due to the change of person and contextual factors (Dunn, 2017). In pediatric occupational therapy outpatient clinics, the occupational therapist must determine the base performance range for the individual. Once this is determined the occupational therapist can develop goals and interventions to directly target the person and their contexts. This will help to increase the tasks that fall within the performance range for the individual.

The toolkit *Improving Occupational Engagement for Children with Executive Dysfunction* will provide information formatted by the guidelines of the EHP model. In the next section the therapist can be referred to information regarding executive function relative to each component of the model to further understand the impacts on daily tasks and overall performance range. The information will be helpful in developing a guide to assist with establishing goals and interventions to support children experiencing concerns with executive dysfunction and sensory processing.

Ethical Considerations

Occupational therapists should always use ethical considerations before implementing evaluations and interventions for their client. Through careful consideration, the occupational therapist should determine interventions that serve risk or benefit to the client before implementing them into the session. In order to have best practice in pediatric occupational therapy, it is essential for the OTP to consider the occupational therapy code of ethics (Cermak & Toglia, 2018).

The occupational therapy code of ethics consists of six principles. These include beneficence, nonmaleficence, autonomy, justice, veracity, and fidelity (American Occupational Therapy Association, 2020). Remembering and utilizing this code of ethics in occupational therapy intervention will ensure best practice. Below is a chart describing all six principles of the occupational therapy code of ethics.

Beneficence	Benefitting others by focusing on their well-being and safety.
Nonmaleficence	Do no harm.
Autonomy	An individual right to make their own decisions and have confidentiality.
Justice	Ensure fair treatment of clients.
Veracity	Providing in depth and accurate information for treatment of the client.
Fidelity	Treat clients and co-workers with respect and fairness in all aspects.

Section 2:

Executive Function

Understanding Executive Function

In order to understand executive function, the concept of cognition should be understood first. Cognition is defined as a term used for the mental operations that involve the use and storage of information (Cermak & Toglia, 2018) Executive function is defined as higher level cognitive processes that occur in the prefrontal cortex, which include skills related to goal directed thoughts, actions, and emotions (Lawson et al., 2018; Cermak & Toglia, 2018). These processes develop throughout childhood into adolescents (Lawson et al., 2018). Executive function can be broken down further into subcategories to include working memory, cognitive flexibility, and inhibition (Cermak & Toglia 2018). These three subcategories work together in the brain for overall cognitive control.

Subcategory	Definition
Working Memory	Hold information in the mind and utilize it to complete an activity.
Inhibition	The ability to resist distractions, control impulses, and maintain attention selectively.
Cognitive Flexibility	Shift between tasks and adapt to changes.

Executive function (EF) consists of consideration for both hot and cold EF. Hot executive function is defined as skills used in emotional and motivating situations (Cermak & Toglia, 2018). Cold executive function is defined as skills used in situations that are considered neutral (Cermak & Toglia, 2018). The chart below establishes a guide for executive function skills that fall under hot vs cold EF.

Type of EF	Skills
Hot: Motivational Situations	- Impulse control - Decision making - Delays in gratification - Temptation resistance - Emotional regulation - Socially acceptable response
Cold: Neutral Situations	Working memory

	- Planning - Strategizing - Flexibility - Problem Solving

Importance of Addressing Executive Function in Kids:

Executive function is an important component of completing daily activities. It is the ability of individuals to organize, plan, be goal directed, adapt to changes, self-regulate, and creatively think during and for completion of tasks (Calderon, 2020). Executive function is a component of development that can occur at different stages for different individuals and can present in various ways. According to Calderon (2020), executive dysfunction can be noted through difficulty with impulse control, difficulty with emotional regulation, and problems completing a variety of tasks. Due to these outcomes, daily activities, academics, play, and socialization can be impacted and lead to difficulty with completion or engagement in tasks (Cermak & Toglia, 2018). Research found that executive function can also predict future outcomes for children, such as chance of engaging in risky behavior, determination of mental and physical health, economic status, future achievement, and quality of life (Moffitt et al., 2011; Diamond & Ling, 2016). Executive function helps individuals adapt to changes and learn new skills (Toglia, 2015). In order to better meet the needs of children, occupational therapist require an understanding of executive function and its relationship to life roles for children (Cermak & Toglia, 2018).

Connection of Sensory Processing and Executive Function

Sensory processing is defined as the way in which an individual registers and interprets sensory information in the environment leading to a typical or atypical response (Critz et al., 2015; Galiana-Simal et al., 2020). There are eight senses in which individuals experience within the environment, to include auditory, gustatory, vestibular, proprioceptive, interoception, touch, smell, and sight (Miller et al., 2020). Children can respond typical or atypical to all sensory input they encounter, known as sensory modulation. A child's ability to modulate sensory input affects the grading of the response to the number of stimuli coming in (Miller et al., 2020).

While this toolkit is focused on executive dysfunction, it can be found that sensory processing plays a key component in executive dysfunction. Sensory processing and executive function concerns often occur together for an individual. In order to meet the executive functioning needs, you must first meet the sensory processing needs. As determined by the sensory therapies and research approach, sensory regulation of processing information forms the basis for development of a child, such as that of executive function (Miller et al., 2020; Pastor-Cerezuela et al., 2020). Consider an upside-down pyramid, at the bottom is sensory processing. This forms the basis for all other areas of need within a person. Once sensory processing needs are met, we can begin targeting other aspects that affect completion in everyday task, such as executive function (Miller et al., 2020). Targeting both areas would help to increase the overall performance range of the individual.

Evidence-based research found that difficulties related to sensory processing concerns could often predict executive dysfunction (Pastor-Cerezuela et al., 2020). It has been noted that the relationship between sensory processing and executive function can be seen through different ages, diagnoses, and different assessment methods (Cermak & Toglia, 2018).

Sensory Processing Diagram

Gustatory

- Processes information related to taste.

Visual

- Processes information in regard to sight.

Auditory

- Processes information related to sound.

Olfactory

- Processes information related to smell.

8 Sensations

Tactile

- Processes information related to touch.

Interoception

- The feelings inside of our bodies such as heartbeat, respirator rate, hunger, etc.

Proprioception

- Orientation, position, location, and movement of muscles and joints

Vestibular

- Balance and orientation based on position of head to gravity

Person Factors

Neural Pathways of Executive Function

Neuroimaging techniques have identified distinct neural pathways related to hot and cold executive functioning abilities. Hot executive function involves the use of the ventromedial and orbitofrontal networks to include the use of the limbic system for mediation of abilities. Cold executive functioning involves the use of the dorsal lateral frontal cortex. Hot and cold executive function work together for processing everyday information in a variety of situations (Cermak & Toglia, 2018).

Common Diagnosis with EF Concerns

- Autism Spectrum Disorder
    - A neurodevelopmental condition in which the individual experiences difficulties related to communication, interaction, and repetitive behaviors (Demetriou et al., 2019).
- Sensory Processing Disorder
    - Difficulty processing incoming sensory stimuli leading to a variety of atypical responses for the child (Galiana-Simal et al., 2020).
- Attention Deficit Hyperactivity Disorder
    - A diagnosis that encompasses a variety of symptoms to include inattention, hyperactivity, and impulsivity which lead to difficulty with higher level cognitive abilities (Nejati, 2021).
- At-risk youth with mental health considerations
- Developmental Coordination Disorder
    - Difficulties related to acquiring and executing motor skills due to a combination of cognitive and motor abilities (Leonard & Hill, 2015).
- Conduct Disorder
    - A diagnosis with consistent behaviors that violate societies rules and the rights of other individuals (Schrool et al., 2018).
- Social Disparities
- Fetal Alcohol Spectrum Disorder
    - a term used to describe children with partial and full fetal alcohol syndrome who experience complex neural and behavioral dysfunction (Kingdon et al., 2016).
- Trauma exposure

Cognitive Milestones

  Executive function can develop at different rates for all individuals. Cognitive milestones of executive function provide a baseline expectation of executive function skills for children within the specified time frame. Below executive function skills are broken down into infancy, preschool, school age, and adolescence as these are the most prominent times for executive function development (Cermak & Toglia, 2018).

Infancy

  Around the time of birth infants develop sensory and perceptual abilities related to noticing touch, taste, and preference towards seeing their mothers face. Visual and auditory discrimination abilities start to develop at a significant rate within the first year. Executive functions during infancy tend to be rudimentary and include working memory, inhibition, flexibility, and problem-solving abilities (Cermak & Toglia, 2018) These abilities include a base understanding of the relationship between cause and effect and response inhibition to distracting stimuli.

Preschool

  At this age children often engage in more goal directed behaviors that involve strategy. The use of working memory is observed in children through continuing to focus on something they saw previously. Working memory and inhibitory control are the areas of executive function that grow the most during this period of life. A sequence to development of executive function can be seen at this stage. Working memory first develops, followed by inhibitory control, leading to the development of cognitive shifting and flexibility (Cermak & Toglia, 2018).

School Age

  At this time in a child's life, demands for the use of executive function increase. Working memory and processing speed continually progress at this stage. Children began to be able to follow instructions with multipole steps, remembers and track occurrences in stories, and complete additional academic requirements. The use of working memory at this stage prepares children for reasoning and planning. As the child continues to age in the school system they have more self-regulation and self-control. Rapid growth occurs in relation to executive functions of cognitive flexibility, goal setting, and information processing.

Adolescence

At this stage, the executive function focus is on increased planning, thinking, and emotional reaction. At this period in time the brain has a significant occurrence in changes for development. Prefrontal maturation occurs at adolescence for most individuals, leading to adult level use of executive function skills and abilities. At this time period, the context of the adolescence creates a significant impact on overall executive function. Due to the brain's continued development, risk-taking behavior is more common in this age group (Cermak & Toglia, 2018).

Contextual Factors

Factors affecting Executive Function:

Contexts play a significant role in the development and outcomes of executive function skills and abilities. In order for the brain to develop properly, individuals need to experience an environment free of excessive stress and opportunities to participate in enriching and stimulating activities. (Center on the Developing Child at Harvard University, 2016) When these do not occur, the development of the brain, and therefore executive function can be impacted. Identified negative factors in relation to brain development include poverty, deprivation, abuse or neglect, violence exposure, substance abuse, and parental mental illness. (Cermak & Toglia, 2018)

Extreme poverty has been studied in relation to overall development for individuals. It has been linked to poor health for both physical and mental outcomes. The biggest factors related to executive function include difficulty filtering irrelevant stimuli and attentional concerns. Overall, the connection has been made that increased exposure to extreme poverty is linked to decreased executive function abilities (Blair & Raver, 2016; Raver et al., 2013).

Abuse and neglect has also been identified as being associated with poor outcomes for children's executive function, putting them at increased risk for a diagnosis of ADHD. Research also indicated that the longer an individual experienced maltreatment, abuse, or neglect, the more impairments experienced in executive function. (Center on the Developing Child at Harvard University, 2012; Kavanaugh, et al., 2017)

Relationship building and connections help to establish a foundation for the development of executive function. When a parent experiences difficulty with mental illness or addiction, often the child is left without the foundation they need for these relationships. Due to this a child can be at higher risk for executive function difficulties in completion of everyday activities (Barker et al., 2013; Reising et al., 2017).

Overall, it has been determined that every risk factor present in early childhood increases children's impairment in executive function. The best way to increase executive function development in the early years is to provide nurturing relationships and early learning and play experiences (Bethel et al., 2016).

Tasks

When a child experiences difficulties related to executive function it can impact a wide range of tasks that they need and want to complete daily. Whether a task is complete or not can also impact the overall executive function for the child. Play, physical activity, nutrition, and sleep can be key factors in executive function skills and abilities.

Play is an important key factor in children's executive function development. Play provides opportunities for learning and growth in the areas of social emotional, motor, cognitive, communication, and adaptive skills. The first key form of play important in the development of executive function is pretend play. It helps to develop executive functions, including working memory, inhibitory control, self-regulation, and formation of ideas. Children utilize their imaginations to develop stories and actions related to their focus of pretend play. Games that are played also benefit children as they establish rule following and turn taking abilities (Cermak & Toglia, 2018). Games can also include those that require students to maintain attention to the rules while playing. These games help target the student's ability to shift attention, inhibit actions, and self-regulation (Cermak & Toglia, 2018). Play with others is also a time that creates behaviors related to the interaction. Play interaction can be positive or negative depending on skills and abilities of the child (Wilkes-Gillan et al., 2014).

Children's involvement in physical activity can be linked to increasing executive function abilities. By the time a child reaches adolescence, signs of engagement in physical activity can be noted through the development of volume in the basal ganglia and hippocampus of the brain (Cermak & Toglia, 2018). Physical activity can also make a change in the brain activity that is occurring for a child (Zelazo et al., 2016; Cermak & Toglia, 2018). Providing children opportunities for engagement in physical activity over longer periods of time showed that children improved in overall executive function abilities (de Greeff et al., 2018).

Sleep is a task we complete on a daily basis that can impact our everyday mental functioning. Sleep can be part of the reason an individual struggles with executive function, while executive function can lead to sleep-related concerns. 15-20% of children between the ages of 2-5 years old and 11-15% of school aged children experience problems with sleeping through the night (Turnbull et al., 2013). Sleep problems were noted to occur more often for children with diagnosis

of ADHD and ASD (Turnbull et al., 2013). Reduction in sleep was found to cause children difficulties related to attention, hyperactivity, various behaviors, and anxiety (Turnbull et al., 2013). In regard to executive function, decreased sleep can lead to concerns with limited development and use of executive functions, executive function concerns such as self-regulation can contribute to decreased ability for normal sleep patterns, and decreased sleep can cause future problems with executive function late into adulthood (Turnbull et al., 2013).

Often at pediatric clinics there is a large emphasis on the impact of sensory processing on daily tasks for children. Clients with sensory processing difficulties often have additional needs related to executive function. Information and interventions can be provided that help to meet the needs in both areas for children at the pediatric outpatient clinic.

Performance Range

Children's performance range is impacted by the persons factors and their contexts (Dunn, 2017). This can increase or decrease the tasks available to the client. Executive function is a person factor that impacts individual's abilities to complete task. This is due to the cognitive requirements of every task. If a child has difficulty with impulsivity, it can lead to distraction from completing tasks, safety concerns, and taking action before we have prepared ourselves. If a child struggles with sequencing, this can lead to difficulty completing daily activities such as washing hands, bathing, getting dressed, brushing teeth, etc. Occupational therapists can target executive function, sensory processing, and contextual factors to meet the needs of children to increase their performance range.

Section 3:

Assessment of Executive Function and Sensory Processing

Overview of Assessment

In order to determine whether or not a child experiences concerns with executive function it is important to complete an assessment. Standardized assessments commonly address a multitude of areas that should be addressed in the pediatric outpatient clinic. To begin assessment of the client, it is best to develop an occupational profile through parent interview and observation of the client (American Occupational Therapy Association [AOTA], 2020). The occupational profile and observation checklist were developed as guided by EHP model and the book titled *Cognition, Occupation, and Participation Across the lifespan* (Cermak & Toglia, 2018)*. Additional questions may be added to the provided occupational profile to ensure that the whole person is addressed during evaluation. The therapist should then provide a standardized assessment that can provide information that is pertinent in determining the specific needs of the client (AOTA, 2020). The occupational therapist will complete re-assessments to determine continuation of need.

Following completion of assessment, the occupational therapist will develop a plan of care which establishes the foundation of strengths and difficulties for the client (AOTA, 2020). This information provides the occupational therapist information that is needed to establish number of therapy sessions required per week. Based on this information the occupational therapist will develop goals targeted at the clients' areas of difficulties. A layout of goal formatting, types of goals, and a goal bank are provided in the toolkit to assist the occupational therapist with development of their assessment. Goals lay the foundation for intervention development which is addressed in section 4 of the toolkit.

__Occupational Profile for Executive Function and Sensory Processing__

Client: _____ **Date:** _____

1. What are your current areas of concern for your child?
    a. _____
    _____
    _____
    _____

2. Are there any areas of sensory you noticed impacting your child?
    a. _____
    _____

    b. How does your child react to touch?
        i. _____
        _____

    c. How does your child respond to sounds?
        i. _____
        _____

    d. How does your child respond to vestibular movement (Swinging, rocking, jumping)?
        i. _____
        _____

    e. Does your child become visually distracted in their environment? (If yes, please explain)
        i. _____
        _____

f. Does your child enjoy crashing or walking into items or people? (If yes, please explain)

    i. _____

    _____

3. Does your child experience difficulty with executive function abilities? (If yes, please explain)

    a. _____

    _____

    b. Does your child have difficulty with initiation of any tasks?

        i. _____

        _____

    c. Does your child have difficulty sequencing tasks? (If yes, please explain)

        i. _____

        _____

            1. If yes, how much assistance do you have to provide to sequence steps of a task?

                a. _____

                _____

    d. Does your child engage in impulsive behaviors? (If yes, please explain)

        i. _____

        _____

            1. Does your child's impulsivity often lead to safety concerns?

                a. _____

                _____

e. Does your child become dysregulated with changes in schedule/routine? (If yes, please explain)
    i. _____
        _____

f. Does your child prefer items placed in specific ways or locations? (If yes, please explain)
    i. _____
        _____

g. Does your child often switch between tasks? (If yes, please explain)
    i. _____
        _____

    ii. How long is your child able to focus their attention on one task?
        1. _____
            _____

h. When your child experiences a problem, are they able to try and solve it, or do they require assistance? (If yes, please explain)
    i. _____
        _____
        _____

i. Does your child easily experience frustration? (If yes, please explain)
    i. _____
        _____

Standardized Assessments

Assessment Name	Description
Behavior Rating Inventory of Executive Function-Preschool Version (Brief Preschool)	Overview: Assessment of children 2-5 years old focused on behaviors and executive function abilities. Areas assessed: • Inhibition • Working memory • Shifting attention • Emotional control • Planning/organizing • Global executive composite • Self-control index • Flexibility index • Emergent metacognition Forms: • Home/Daycare • Preschool (Gioia et al., 2002)
Behavior Rating Inventory of Executive Function (BRIEF2)	Overview: Focused on determining areas of difficulty related to executive function for children 5-18 years old. Areas assessed: • Inhibition • Self-monitor • Shifting attention • Emotional control • Working memory • Plan/organize • Initiate

	• Task monitor • Material organization • Task completion Forms: • Parent • Teacher • Self-report • Parent/Teacher ADHD • Handouts for interventions can also be purchased. (Gioia et al., 2015)
Hawaii Early Learning Profile (HELP)	Overview: Curriculum and family-based assessment for children 0-3 and 3-6 years old. Areas assessed: • Cognitive • Gross motor • Language • Fine motor • Social-emotional • Self-help Forms: • HELP 0-3 strand • HELP Family-centered parent interview • HELP 3-6 strand (2006, VORT; 2010, VORT)
Miller Function and Participation Scales (M-FUN)	Overview: An assessment that compares children aged to scaled scores, percentiles, and age equivalence. Areas assessed: • Executive function • Behavior

	• Hand function • Visual perception • Motor abilities Forms: • Workbooks • Home Observations • Classroom Observations (Miller, 2006)
Sensory Profile	Overview: Caregiver provided information on the child's sensory response to the 8 types of sensory stimuli within their environment. Areas assessed: • Vestibular • Proprioceptive • Interoception • Site • Sound • Touch • Taste • Smell • Sensory seeking • Sensory registration • Sensory avoiding • Sensory sensitivity Forms: • Sensory profile • Toddler sensory profile (Dunn, 2014)

Observation Checklist

Focus area	Yes/No	Additional Comments
Able to independently initiate tasks.		
Plans out an activity.		
Able to sequence steps of a task.		
Considers action before taking it (Refrains from impulsive actions).		
Maintains attention to selected task for 5 minutes or more.		
Able to recall information.		
Able to shift from one task to another when asked.		

Able to discover a way to use an item.		
Fidgets during completion of task.		
Seeks out sensory input.		
Avoids sensory input.		

Goal Establishment Overview

The information gathered through interview, observations, and assessments will help to establish necessary goals for the client. Based on the needs of the client the type of goals that will work best can be determined. Below is a chart explaining different types of goals that can be developed to meet the needs of the client.

Types of Goals

Type	Description
Maintenance goals	Focused on maintaining where a person is at in order to decrease chance of reduction in skills and abilities.
Restorative goals	Restore skills that a person had previously.
Habilitative goals	Focuses on client's abilities to develop new skills they did not previously have.
Modification goals	Change the context or tasks to increase client participation.
Preventative	Established to prevent harm from coming to a client based upon actions.
Health Promotion	Focused on improving occupational health and engagement without the existence of a problem.

(Sames, 2015)

COAST Goals

<u>Purpose:</u> COAST formatting provides a method of goal breakdown and development that specifically addresses occupation as part of the goal (Gately & Borcherding, 2012; Sames, 2015). When working with clients who experience executive dysfunction it is important to establish goals focused on the specific areas of executive function that interrupt their ability to complete a task.

C: Client	The person the goal is referring to.
O: Occupation	The task the client is completing in order to meet the goal.
A: Assistance level	The amount of assistance an individual is able to complete the goal with.
S: Specific condition	The environment or items required to meet successful completion of the goal.
T: Timeline	The time frame in which the goal will be completed in.

(Gately & Borcherding, 2012; Sames, 2015).

Example COAST Formatting

Client	Sam
Occupation	Brush Teeth
Assistance Level	Independently
Specific Conditions	Visual Schedule
Timeline	2 months

Example: Sam will independently brush his teeth with the use of a visual schedule for assistance within 2 months.

Client	Ally
Occupation	Homework
Assistance Level	3 verbal cues
Specific Conditions	Planner
Timeline	6 weeks

Example: Ally will complete her homework utilizing a planner with 3 verbal cues within 6 weeks.

Client	Patricia
Occupation	Tie shoes
Assistance Level	Independently
Specific Conditions	3/5 attempts
Timeline	6 weeks

Example: Patricia will be able to independently tie her shoes on 3/5 attempts within 6 weeks.

Client	Jacob
Occupation	Nighttime routine
Assistance Level	Min assistance
Specific Conditions	Checklist
Timeline	Within 12 weeks

Example: Jacob will use a checklist to complete his nighttime routine with min assistance within 12 weeks.

(Gately & Borcherding, 2012; Sames, 2015)

Goal Bank

Inhibition:

- The client will independently inhibit automatic response to environmental stimuli on 3/5 attempts within 6 months.
- The client will independently attend to therapist-directed task for 5 minutes without being distracted by environmental stimuli within 6-12 months.
- The client will consider safety of scenario before performing action across 5 sessions.
- The client will independently complete one activity at a modulated speed without missing a step 3/5 times within 6 months.

Cognitive Flexibility:

- The client will independently shift attention from preferred to a non-preferred task within 6 months.
- The client will maintain a regulated state during a change in schedule per parent report within 6-12 months.
- The client will respond appropriately to social interaction with 3 verbal cues within 2 months.
- Within 3 months the client will identify errors during sequencing activity on 3/5 occasions with 2 verbal cues from therapist.

Working Memory:

- The client will initiate 3/5 tasks to complete during the therapy session within 6 months.
- The client will develop a written plan for one activity within 6 weeks.
- The client will be able to independently sequence 6 steps of a daily task within 6 months.
- The client will be able to sequence 4 steps of a daily task with 3 verbal cues from therapist within 6 weeks.

Disclaimer

Goals provided in this toolkit are for example purposes only. They can be used within a plan of care if they fit the needs of the identified client. Goals can be modified as needed to be more individualized to specific clients. Goals provided in this toolkit solely focus on the three main subcategories of executive function:

inhibition, cognitive flexibility, and working memory. Additional goals should be developed that focus on other areas of concern for the child not addressed within executive function to meet the whole person's needs.

Section 4:

Interventions for Executive Function

Overview of Intervention

This toolkit was established for children who at a minimum meet the cognitive milestones of holding 2 step directions in mind, have a beginning ability of shifting actions according to changes, and have inhibitory control for at least 4-5 minutes. At maximum these children will meet the cognitive milestones of recalling 5 items in order, ability to follow some rules, and increased adaption to changes. All interventions provided in this toolkit can be graded up or down to meet the needs of children at different cognitive levels.

Interventions developed in this toolkit were established utilizing a simple form of activity analysis. A table is provided describing all parts of an activity analysis when completed in full. Additionally, this toolkit provides a template that therapist can use to plan their interventions they plan to use for the therapy session. In utilizing this handout, the session can be more organized and provide awareness prior of needed materials for the session.

Interventions are provided in this toolkit to target executive function within the therapy session. Executive function can be targeted through a wide range of activities and interventions that address other areas of need. All interventions provided are baseline to get the therapist started in addressing the needs of the client. Interventions in this toolkit are guided by the ecology of human performance (EHP) model intervention approaches (Dunn, 2017). Descriptions of these approaches are provided in a chart on the next page to provide an understanding of each approach. Each intervention is labeled according to the type of EHP intervention approach it correlates with.

EHP Intervention Approaches

Adapt/Modify	**Description:** Interventions that involve changing parts of the tasks or the context that a person engages with in order to increase participation in occupation. **Examples:** Children can be provided with a visual schedule to use for their occupations to assist in sequencing.
Create	**Description**: Developing circumstances that support individuals in completing occupations. At this point a problem does not exist and it is not assumed that one will exist in the future. **Examples:** Providing a program to a group of children to help learn new abilities to make them more successful in their everyday occupations.
Establish/Restore	**Description:** Focuses on person factors and works to improve skills or establish new skills. **Examples:** Helping a child to learn to sequence a task in the appropriate order for successful completion.
	Description: Focused on changing the person, task, or

Prevent	context to prevent a problem from occurring down the road. **Examples:** Teaching children proper safety rules will help to prevent an accident later on.
Alter	**Description:** Interventions for alter are aimed at the context of the person. Finding the best match for the person's abilities within their context. **Examples:** Moving a child from one school to another in order for them to obtain necessary supports.

(Dunn, 2017)

Activity Analysis Breakdown

Activity analysis assist in breaking down the task to determine all requirements of the task. A simplified version of activity analysis was used to provide overview of each intervention within this toolkit. Below is a chart that provides an overview of the items that can be seen within a full activity analysis.

Activity Awareness	Determination of specific occupation/task that needs to be analyzed.
Type of Activity Analysis	Occupation based activity analysis focused on a specific client or activity analysis without a specific client.
Determination of Importance	Establishing how this task/occupation may impact the client.
Steps of the task	Breakdown the activity into simple steps.
Objects/Properties	Determine all equipment needed to complete the activity.
Space demands	The amount of room and location required for completion of this activity.
Social demands	Expectations from others and social rules that should be followed
Body Functions	Requirements of the body to include strength, movement, cognition, sensory, and emotional functions.
Body structures	Parts of the body that are required to complete the activity.
Performance Skills	Establishes the level of the skills that is required to complete the activity.
Therapeutic Intervention	Focused on adapting the activity to meet the needs of the client (Grade up, grade down, etc.).

(Thomas, 2015)

Therapy Session Guide

Client_____   **Date**_____

Intervention Idea	Instructions	Required Materials

Intervention Idea	Instructions	Required Materials

Intervention Idea	Instructions	Required Materials

Animal Walk Red Light/Green Light

EHP Intervention Approach: Establish/Restore

Description: In this intervention, the traditional game of red light/green light is played in combination with animal walks.

Instruction:

1. The therapist provides an overview of the game to the child including rules.
   a. If green light is stated, the child should continue towards the finish line moving like the selected animal.
   b. If red light is stated, the child must freeze.
   c. If the child moves when red light is stated, they must return to the starting line.
   d. If the child does not perform the stated animal walk they should be reminded. If it continues they must start the game over to establish rule following.
   e. The round of the game ends when the child reaches the finish line.
2. The child and therapist then work to come up with animals to move like while playing the game, one animal per round of the game.
3. The therapist and child write down the animals on the list provided and place it in an area where it can be easily referenced.
4. The therapist then should ask the child if they remember the first animal they chose to move like. Each round the therapist should have the child state the correct animal for the round.
5. Once the child has identified the animal, they should stand on the starting line.
6. The therapist should state green light allowing the child to move like the selected animal.
7. Throughout the course the therapist should state red light/green light multiple times.
8. Refer back to rules as needed to remember consequences of not freezing or performing the animal walks during each round.
9. Once the child finishes a round they should go back to the start line.
10. The therapist should then have them state the next animal associated with the round and start the game again. The game should continue like this until all animals on the list are complete.

Required Materials:

1. Provided list to keep track of animal walks.
2. Pen/Pencil to write animal walks out.

Space Demands:

1. Enough area for the child to move from one side of the room to another.
2. This activity would be safest to perform in a room with plenty of light and decreased obstacles.

Body Functions:

1. Executive Functions:
    a. Attention
    b. Inhibition
    c. Planning
    d. Sequencing
    e. Working Memory
2. Sensory Processes
    a. Proprioceptive
    b. Vestibular
    c. Auditory
    d. Visual

Activity Adaption:

1. Grade Up: In order to grade this activity up the child should be in charge or coming up with the animals on their own and writing them in a specified place.
2. Grade Down: In order to grade the activity down the therapist can develop ideas or the child can select for the animal walk suggestion list provided in this toolkit.

Suggested Animal Walks

Crab Walk	**Instructions:** 1. Position self as demonstrated in photo. 2. Move forward/backward while holding this position. 3. Keep abdomen raised at all times during movement.
Flamingo Walk	**Instructions:** 1. Position self as demonstrated in 1st photo. 2. Take long strides alternating legs as demonstrated in 2nd photo. 3. After each stride come back to one legged position.

Bear Crawl	**Instructions:** 1. Position self as demonstrated in photo 1. 2. Move forward keeping hands and feet on the ground as you walk. 3. Move in demonstrated position during entirety of the walk.
Dinosaur Walk	**Instructions:** 1. Position self as demonstrated in the photo below. 2. Move in this position, stomping at each foot placement. 3. Hands should move back and forth holding the demonstrated position in the photo.

Dog Walk	**Instructions:** 1. Position self as demonstrated in photo below. 2. Continue movement by crawling on hands and knees until you reach the finish line.
Snake Slither	**Instructions:** 1. Lay flat on the ground as demonstrated in the photo below. 2. Army crawl across the floor until the finish line is reached.

Cheetah Walk	**Instructions:** 1. Position self as demonstrated in photo below. 2. Move on hands and knees with large strides. 3. Go as fast as you can while maintaining this position.
Frog Hops	**Instructions:** 1. Position your self in a frog position as demonstrated in photo 1. 2. Jump straight up as demonstrated in photo 2. 3. Return to frog position. 4. Each jump should move you forward.

Kangaroo Jumps	**Instructions:** 1. Position self as demonstrated in photo below. 2. Jump straight up and down with arms bent in the front. 3. At each jump you should move forward.
Penguin Waddle	**Instructions:** 1. Position self as demonstrated in photo below. 2. Waddle back and forth. 3. Take small steps as you waddle to slowly move forward. 4. Knees and feet should remain side by side as the movement continues.

Ordered List for Animal Walks

1._____

2._____

3._____

4._____

5._____

6._____

Scooter Board Treasure Hunt

Intervention Approach: Establish/Restore

Description: Utilizing a scooter board, the child should travel around the identified space to collect items one at a time and bring them back to the starting line.

Instruction:

1. The therapist should provide an overview of the game and rules to the child.
    a. You will sit or lay on the scooter board to move around the room.
    b. The child must remain on the scooter board for the entire game. If the child does not, they should restart at the starting line before being allowed to collect additional items.
    c. One item can be collected at a time and should be brought back to the starting line.
    d. If more than one item is picked up, the child should place on item back.
    e. If the child does not place the item back, the therapist will replace one of the items for the child to find.
    f. Once all items are collected the game is finished.
2. Have the child select a scooter board.
3. Provide the child with the type and number of items they will be finding.
4. Give the child the choice between sitting on the scooter board or laying on their stomach on the scooter board.
5. Allow the child to position themselves on the scooter board at the starting line.
6. State "Go" when the child can start the task.
7. Once the child has found all of the items they have completed the activity.

Required Materials:

1. Scooter board
2. Object of choosing to place around room (Pom pom balls, letters, animals, etc.)

Space Demands:

1. Enough room is required for movement on a scooter board.
2. The room should have good lighting and limited obstacles to ensure safe navigation with a scooter board.

Body Functions:

1. Executive Functions:
    a. Working memory
    b. Inhibition
    c. Attention
2. Sensory Processes
    a. Vestibular
    b. Proprioceptive
    c. Visual

Activity Adaptions:

1. <u>Grade Up:</u> This activity can be graded up by requiring the child to find an increased number of items around the room. The therapist can also require the child to complete an obstacle course while on scooter board.
2. <u>Grade Down:</u> This activity can be graded down by requiring the child to find a smaller number of items in the room. The therapist can also decrease the amount of space needed to travel to find items in the room.

Listen then Move

Intervention Approach: Establish/Restore

Description: A game of movement where kids have to listen to multistep directions before beginning the movement.

Instructions:

1. Provide an overview of the instructions to the child.
   a. The therapist is going to state a list of movements you must complete in order.
   b. Wait until the therapist is done talking and states "go" to begin the movement.
   c. The goal is to try and remember all movements in order during the game.
   d. If you cannot remember ask the therapist for a clue.
2. Determine the number of steps the child must complete before beginning the movement.
3. Determine how many rounds of movements to complete with the child.
4. Read the child the movement out loud, reminding them to listen first.
5. State "go" when they can begin.
6. Once they have completed all the movements, the game is finished.

Required Materials:

1. Print out of directions.
2. Any materials needed to complete an activity (balance beam, ball, bean bags, etc.).

Space Demands:

1. This activity should be completed in a space that allows for movement.

Body Functions:

1. Executive Functions
   a. Attention
   b. Sequencing
   c. Working Memory
   d. Initiation
   e. Inhibition
   f. Planning

2. Sensory Processes
    a. Visual
    b. Auditory
    c. Tactile
    d. Proprioceptive
    e. Vestibular

Activity Adaptions:

1. <u>Grade Up:</u> This activity can be graded up by requiring the child to remember more tasks to complete in each sequence. This activity can additionally be graded up by having the child come up with movement ideas and then placing them in a bowl. The child can then draw out a specified number of movements and remember the movements they are to complete.
2. <u>Grade Down:</u> This activity can be graded down by decreasing the number of steps to complete in each sequence.

Two-Step Movement Sequencing

Jump three times then skip to the end of the room.

Crawl like a bear to the middle, then dinosaur walk to the end of the room.

Throw 5 bean bags and then hop on one foot.

Walk across the balance beam and then throw three basketball shots.

Roar like a lion and then meow like a cat.

Do three jumping jacks, then hop like a frog.

Sneak across the floor as quietly as possible, then make giant and loud stomps back.

Crab walk to the other side of the room, then find four green items.

Three-Step Movement Sequencing

Jump three times, Skip to the end of the room, kangaroo hop back to the start.

Crab walk to the middle of the room, do 5 jumping jacks, then play catch 5 times.

Throw 5 bean bags, hop on one foot for 10 seconds, then gallop across room.

Walk across the balance beam, make three basketball shots, then do superman for 10 seconds.

Roar like a lion, stand in tree pose for 10 seconds, and then do 5 big breaths.

Do four frog hops, walk around the room once, then stand on one foot for 10 seconds.

Sneak across the floor as quiet as possible, then make giant and loud stomps all the way back, then find five gold coins in the sandbox.

Planning Worksheet

Intervention Approach: Adapt/Modify

Description: The focus of this activity to enable a child to work towards meeting the goal of accomplish a specific activity of their choosing. It provides them the opportunity to consider the activity, goals that should be met, steps required, and the materials that will be needed before beginning the activity.

Instructions:

1. Print out the provided worksheet.
2. Provide the worksheet to the child.
3. Give the child the following instructions about the activity.
   a. This activity includes boxes with specific questions you will need to answer. We can work together to complete this activity.
   b. In the first box, I want you to decide on one activity that you would like to be able to do.
   c. In the second box, I want you to come up with your goals for completing this activity.
   d. In the third box, write down the steps that are required in order for you to complete this activity.
   e. In the fourth box, write down any items that you will need to work on completing this activity.
   f. Now that the worksheet is complete, we will use it to work towards the specified activity.

Required Materials:

1. Print out of worksheet for planning activity.
2. Pencil/Pen

Space Demands:

1. A table with a chair to sit at while completing the activity.
2. A room that is quiet to increase ability to focus on task.

Body Functions:

1. Executive Functions
   a. Planning
   b. Organization

        c. Sequencing

        d. Working Memory

  2. Sensory Processes:

        a. Visual

        b. Auditory

Activity Adaption:

1. <u>Grade Up:</u> This activity can be graded up by requiring the child to complete this worksheet for more than one activity.
2. <u>Grade Down:</u> This activity can be graded down by decreasing the number of questions the child needs to respond to on the planning worksheet. The therapist can also help to plan the activity and goals.

What activity would I like to be able to do?	What goals can I establish related to this activity?
	●
	●
	●

What are the steps to complete my goals?	What are the items you need to complete this activity?
●	●
●	●
●	●

Additional Notes:

_____

_____

_____

_____

_____

<u>Visual Schedules</u>

Intervention Approach: Adapt/Modify

Description: Visual schedules are used as a guide to complete daily activities. A visual schedule can be created for various activities and helps the child have a reference to avoid missing a step-in task completion. Additional pictures not provided in this intervention can be purchased from other resources to be used for creating the visual schedule.

Instructions:

1. Determine specific tasks the child is having difficulty completing.
2. Apply Velcro in both locations of dots on the visual schedule.
3. Apply Velcro to the back of arrows and of picture cards.
4. Provide a visual schedule with associated tasks for the child to take home.
5. Provide education on visual schedules to the parent.
6. Demonstrate use of the visual schedule with both the child and the parent.

Required Materials:

1. Visual schedule with appropriate number of steps for specific child
2. Velcro to be placed on dot marks of visual schedule and on back of arrow.
3. Printed arrow that can be moved as each step is completed.
4. Pictures of specified tasks and steps as determined by parent and child.

Space Demands:

1. A spot that is easily visible and accessible, near the location where the identified task is to be completed.

Body Functions:

1. Executive Functions
    a. Sequencing
    b. Attention
    c. Planning
    d. Organization
    e. Initiation
2. Sensory Processes
    a. Visual
    b. Auditory
    c. Interoception

Activity Adaptions:

1. <u>Grade Up:</u> The activity can be graded by increasing the number of steps/ activities to be completed on the visual schedule.
2. <u>Grade Down:</u> The activity can be graded down by decreasing the number of steps/activities to be completed on the visual schedule.

<u>Arrow Print Out for Visual Schedule</u>
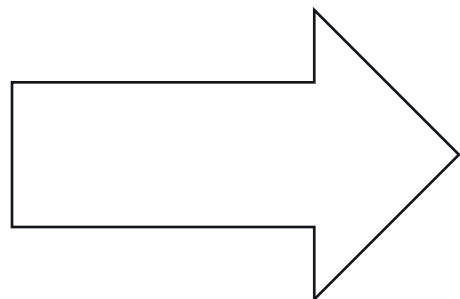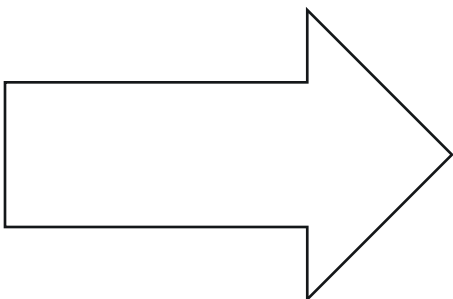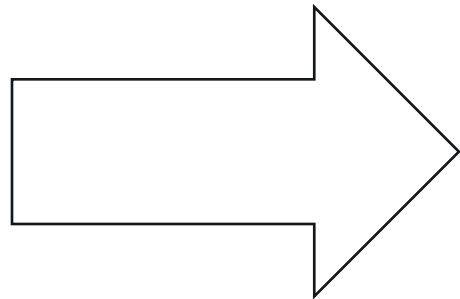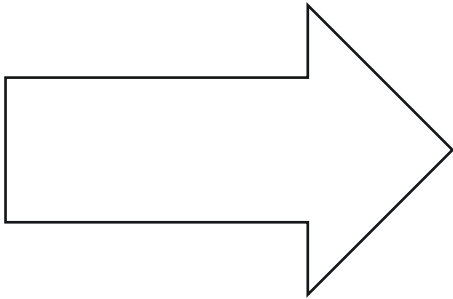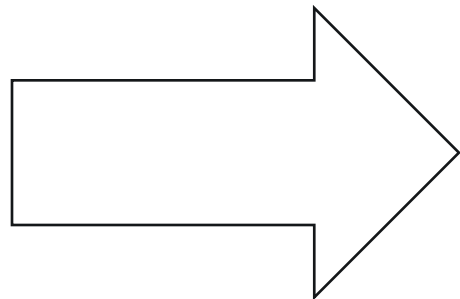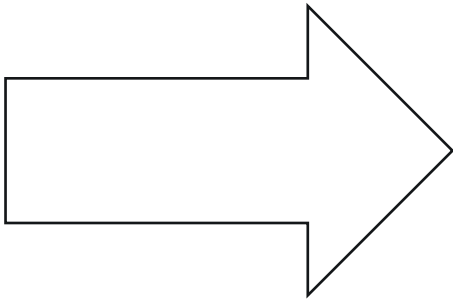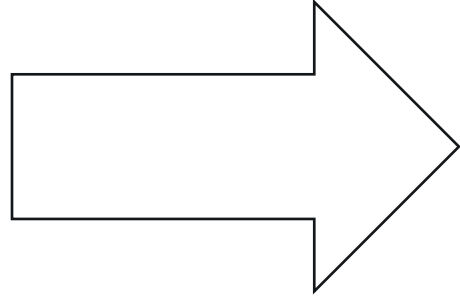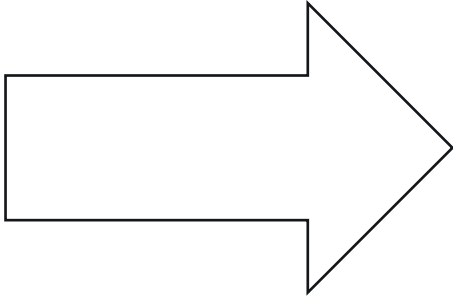
Three Step Schedule

Four Step Schedule

Five Step Schedule

Five Step Schedule
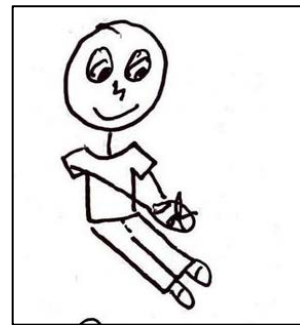
Picture Bank for Three Step Schedule

Getting Dressed:
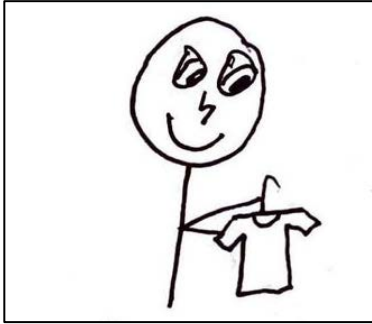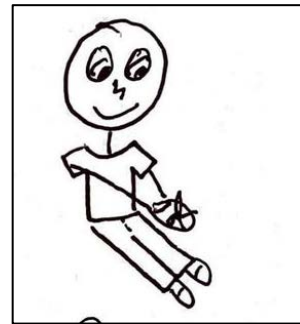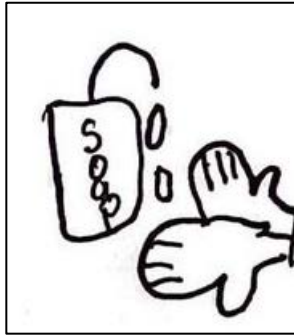
Put on shirt	Put on pants	Put on shoes

Handwashing:
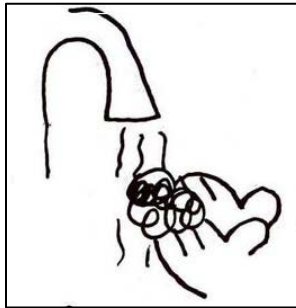
Put soap on hands	Rinse soap off hands	Dry hands
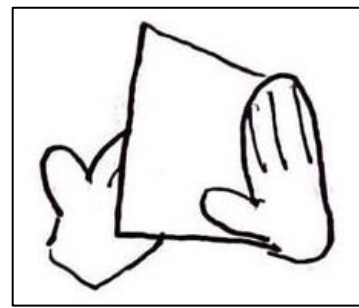
Teeth Brushing:

Place toothpaste on toothbrush	Brush Teeth	Rinse Toothbrush
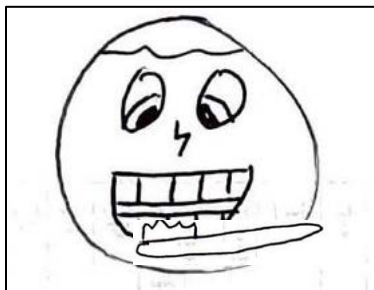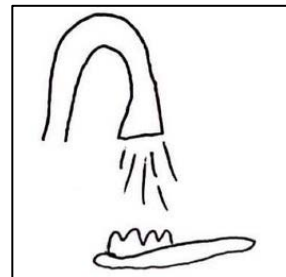
Taking a Shower:
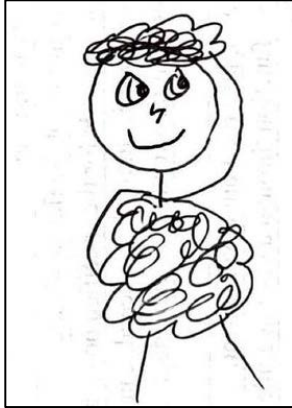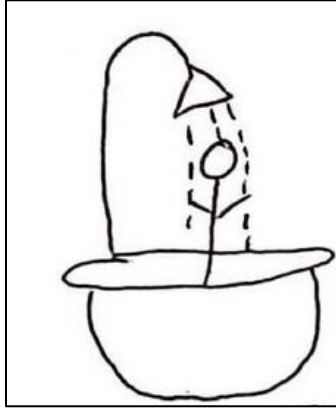
Wash self	Rinse self-off	Dry self
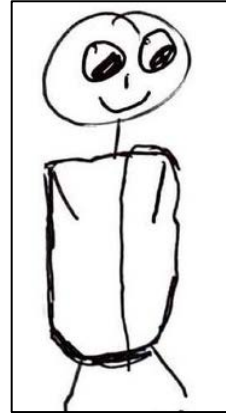
Picture Bank for Four Step Schedule

Getting Dressed:
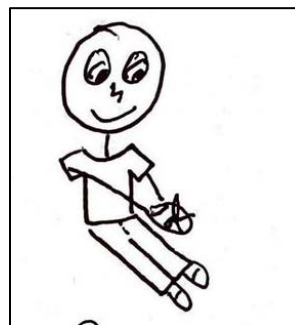
| Put on shirt | Put on pants | Put on socks | Put on shoes |

Handwashing:
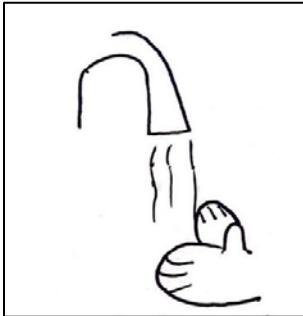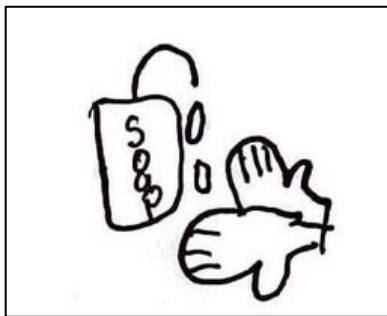
| Wet hands | Put soap on hands | Rinse soap off hands | Dry hands |
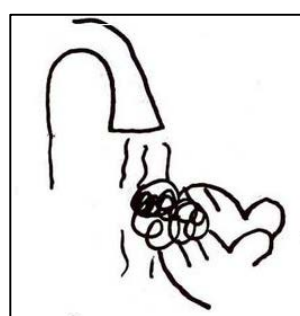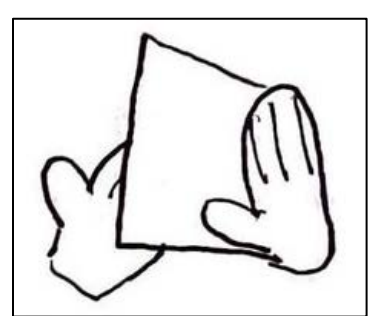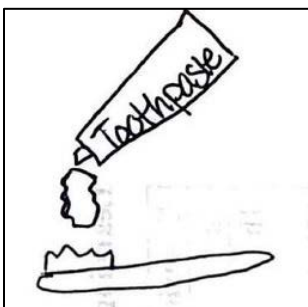
Teeth Brushing:

| Place toothpaste on toothbrush | Brush Teeth | Rinse mouth | Rinse toothbrush |
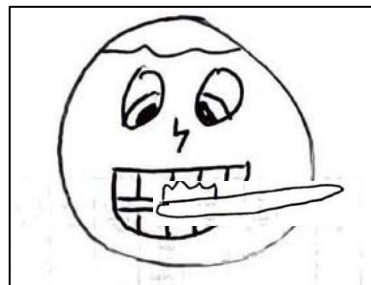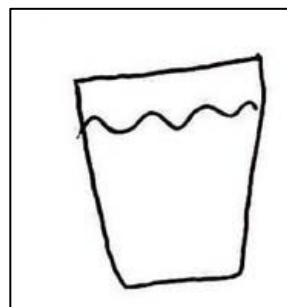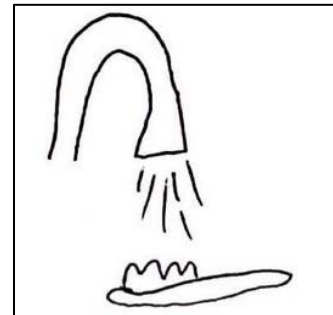
Taking a shower:
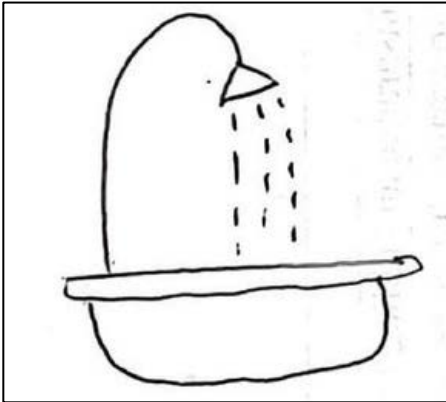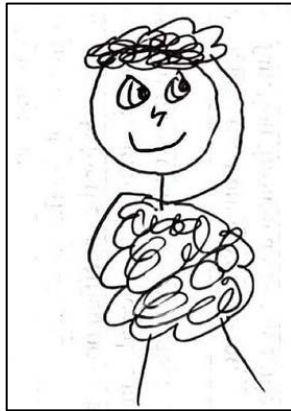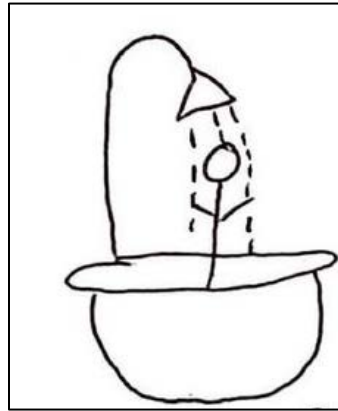
| Turn on water | Wash self | Rinse self | Dry self |
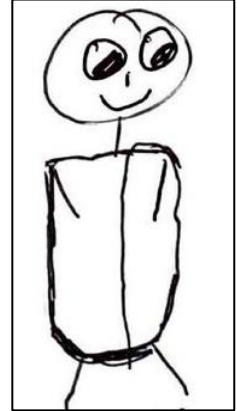
Picture Bank for Five Step Schedule

Getting Dressed:
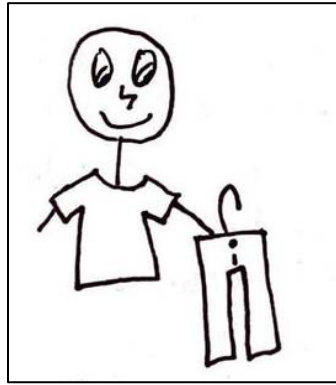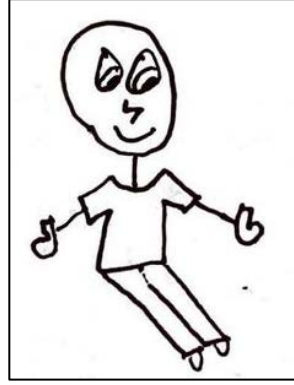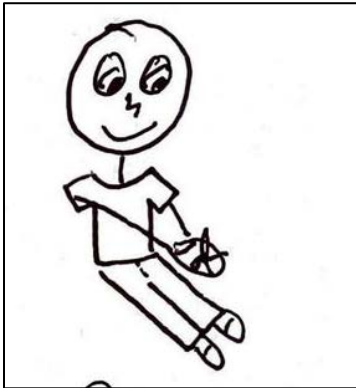
Put on shirt	Put on pants	Put on socks

Put on shoes	Put on jacket

Handwashing:

Wet hands

Put soap on hands
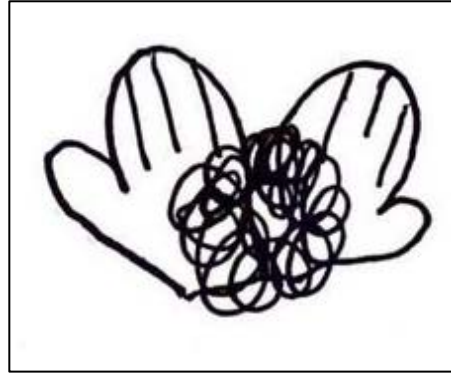
Scrub hands together with soap
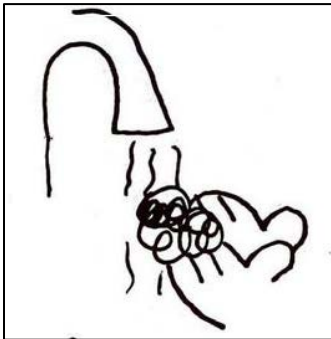
Rinse soap off hands
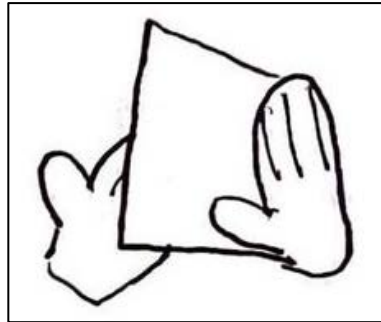
Dry hands
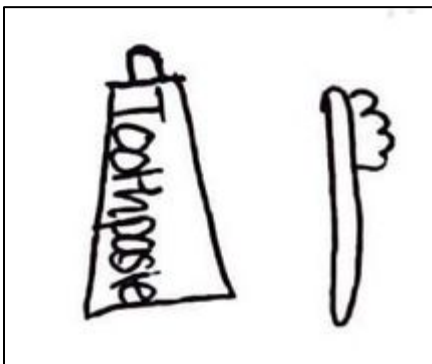
Teeth Brushing:

Find toothbrush and toothpaste
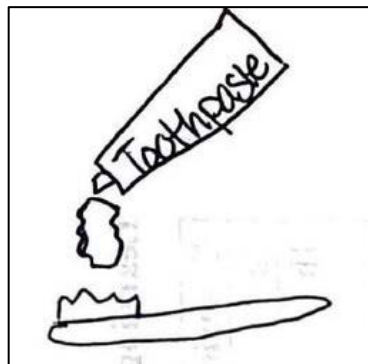
Place toothpaste on toothbrush
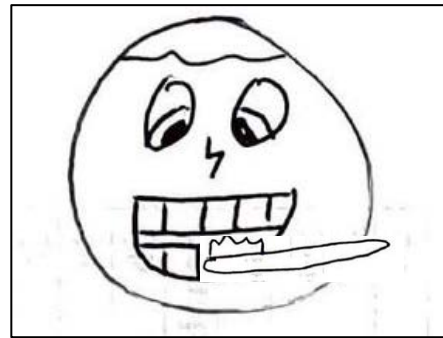
Brush teeth
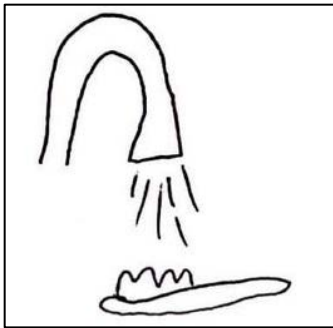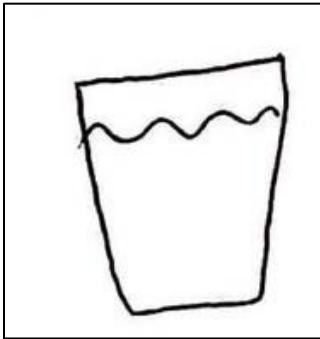
Rinse mouth

Rinse toothbrush

Taking a Shower:
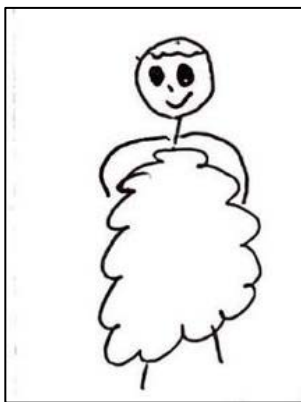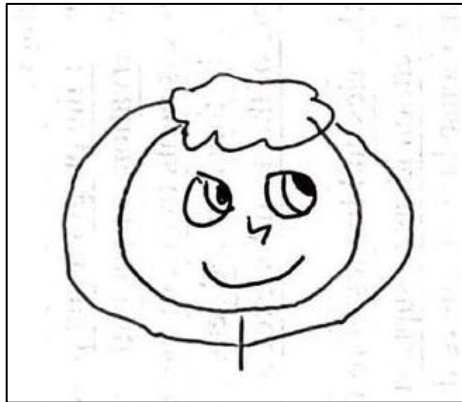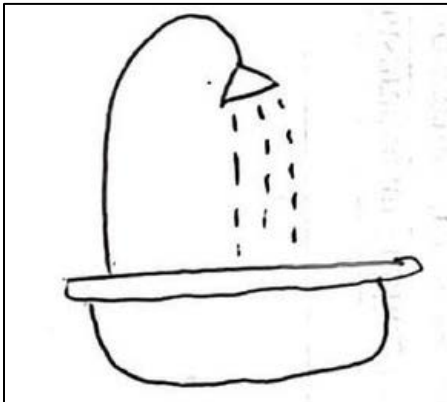
Turn on water

Wash hair

Wash body
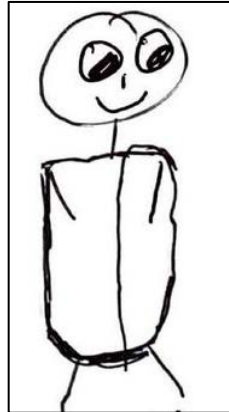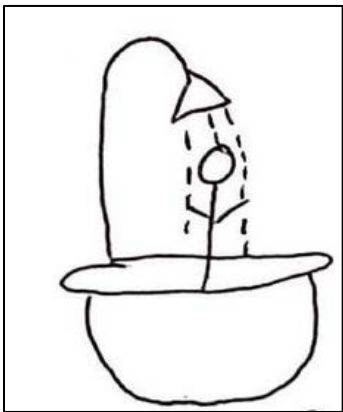
Rinse self

Dry self

Additional Activities:

Brush hair

Get out of bed
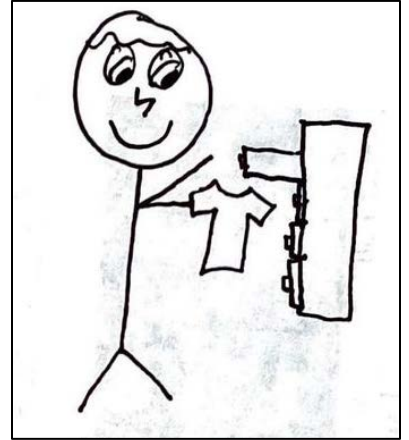
Put away laundry
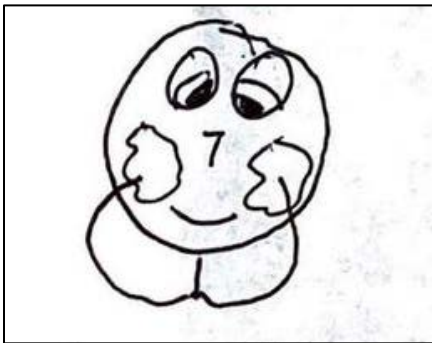
Wash face
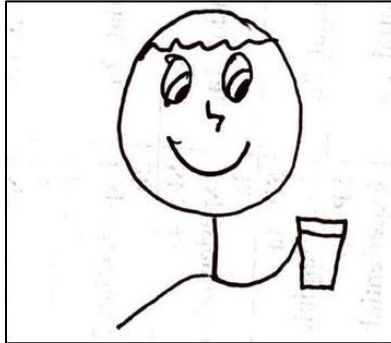
Get a drink
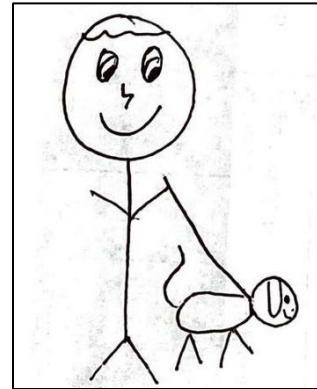
Walk the dog
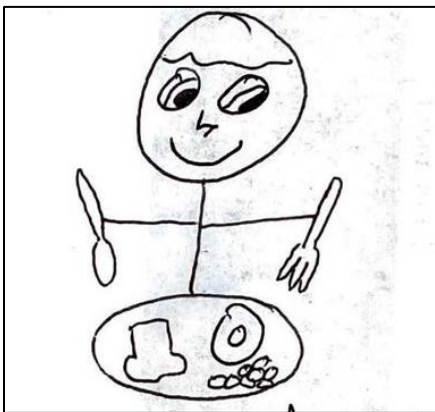
Eat food
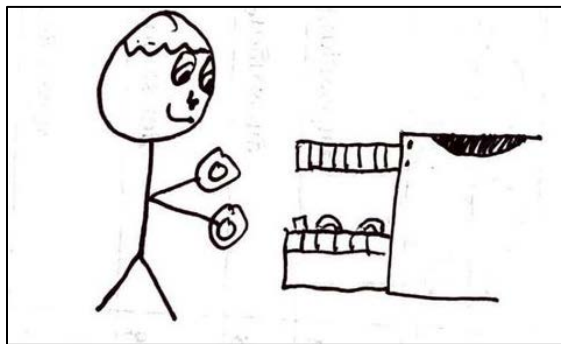
Put away dishes
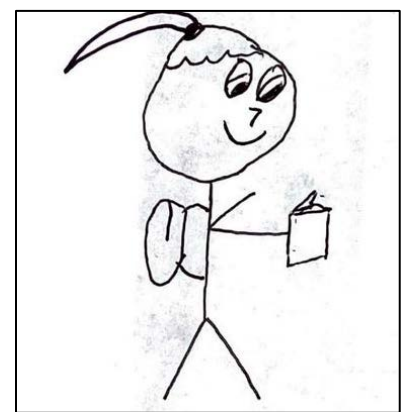
Go to school
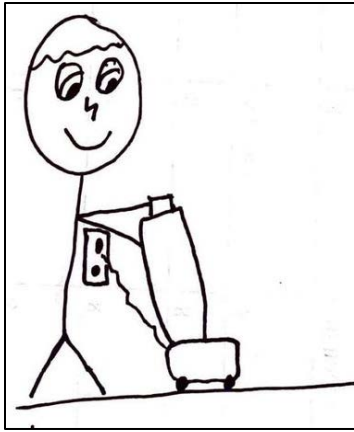
Vacuum the floor
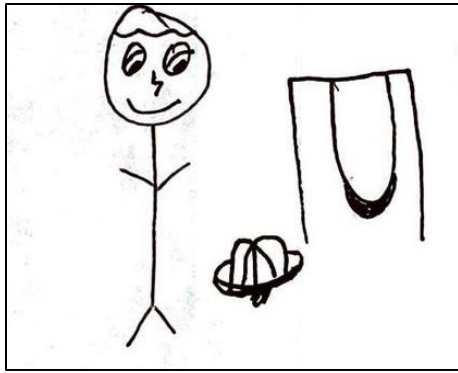
Go to the park
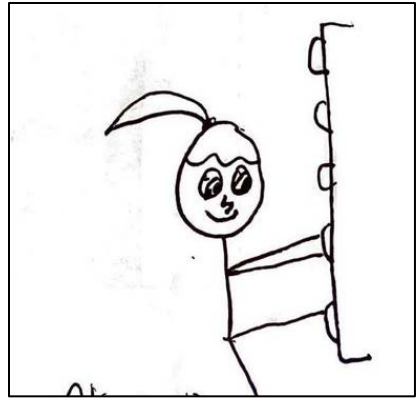
Climb the rock wall

Feed the dog
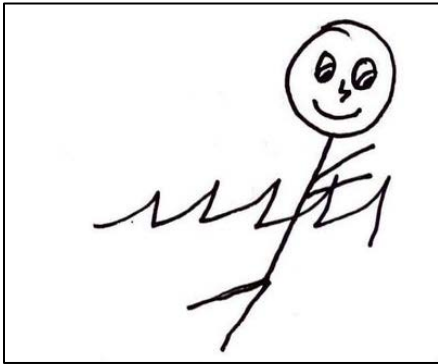
Go swimming
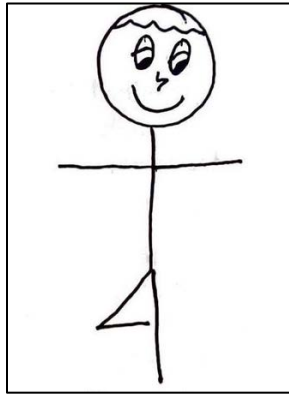
Do yoga
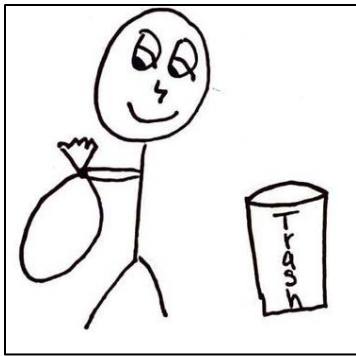
Take out the trash

Clean room
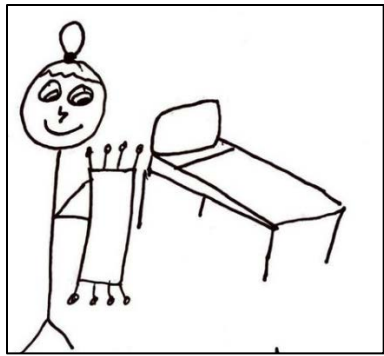
Make the bed
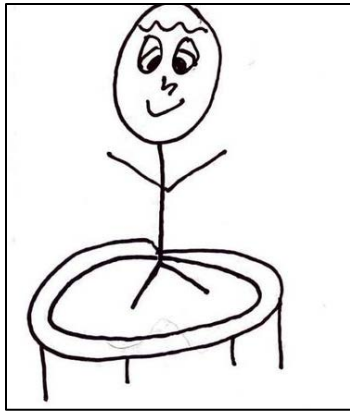
Jump on trampoline
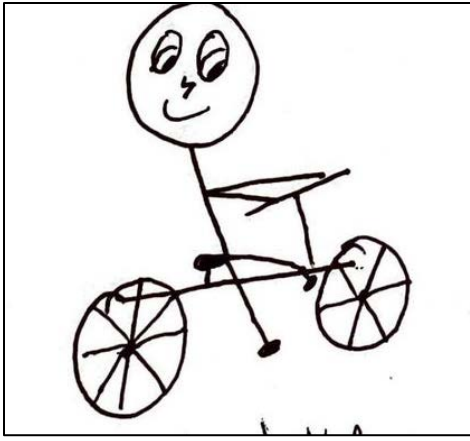
Ride a bike

<u>Sequencing Practice Charts</u>

EHP Intervention Approach: Establish/Restore

Description: Sequencing charts are an intervention that is easy to integrate into the occupational therapy session and in the home environment. The focus of this activity is learning the sequence of steps to various tasks the child completes during the day.

Instructions:

1. Print out prepared materials below
2. Provide appropriate sequencing chart and pictures to child.
3. Have the child identify the task that will be sequenced.
4. The child should select the appropriate pictures and place them in the correct order on the board.
5. Once the child has correctly sequenced all steps of the activity it is completed.

Required Materials:

1. Sequencing practice chart
2. Pictures based off identified task
3. Tape/Glue to place pictures

Space Demands:

1. This activity requires that it be completed at a table with chairs for sitting.
2. The room should have decreased noise to allow the child to focus while completing the task.

Body Functions:

1. Executive Functions
   a. Sequencing
   b. Planning
   c. Working Memory
   d. Attention
2. Sensory Processes
   a. Visual

Activity Adaptions:

1. Grade Up: In order to grade the activity up the child can have a board requiring extra steps, or the therapist can lay pictures out for a variety of

tasks and make the child select the most appropriate pictures for the identified task. The therapist could also require the child to draw out each step on the board rather than using the provided photos.

2. <u>Grade Down:</u> In order to grade this activity down the therapist should provide the child with a smaller number of steps to fulfil and only lay out photos that correlate with the identified task.

Three Step Practice Chart

Step 1	Step 2	Step 3

Step 1	Step 2	Step 3

Getting Dressed:
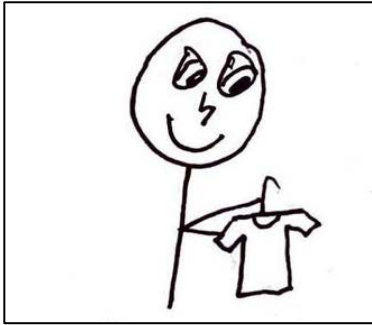
Put on shirt
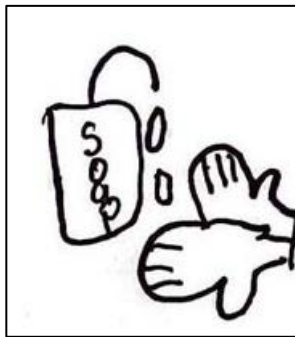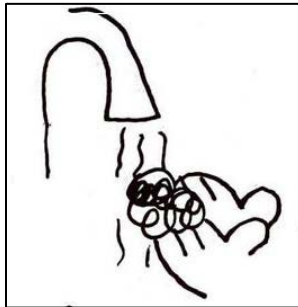
Put on pants

Put on shoes

## Handwashing:

Put soap on hands

Rinse soap off hands
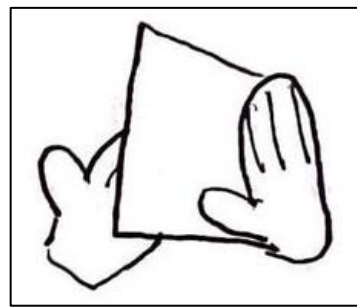
Dry hands
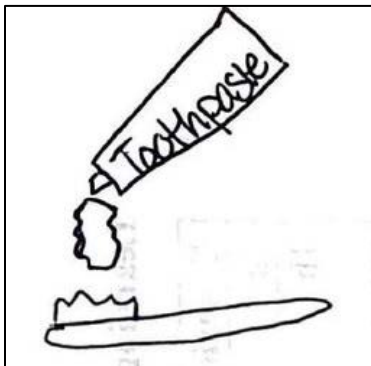
## Teeth Brushing:

Place toothpaste on toothbrush
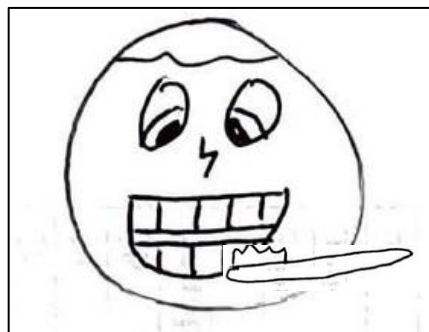
Brush Teeth
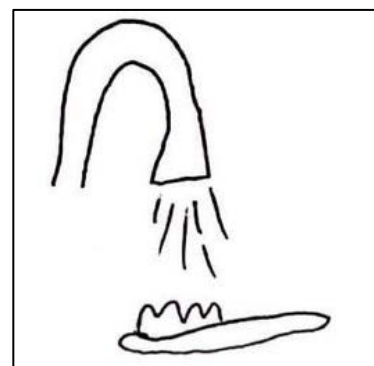
Rinse Toothbrush

Taking a Shower:
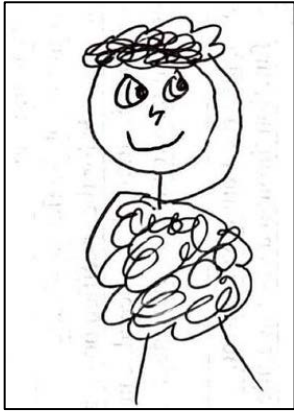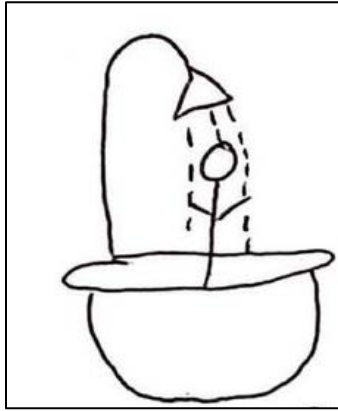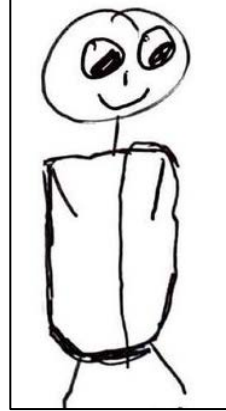
| Wash self | Rinse self-off | Dry self |

<u>Four Step Practice Chart</u>

<u>Step 1</u>	<u>Step 2</u>	<u>Step 3</u>	<u>Step 4</u>

<u>Step 1</u>	<u>Step 2</u>	<u>Step 3</u>	<u>Step 4</u>

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Picture Bank for 4 Step Sequencing Chart
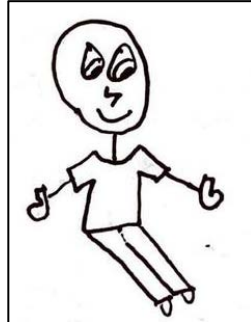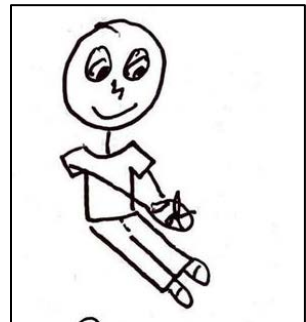
Getting Dressed:

| Put on shirt | Put on pants | Put on socks | Put on shoes |

Handwashing:
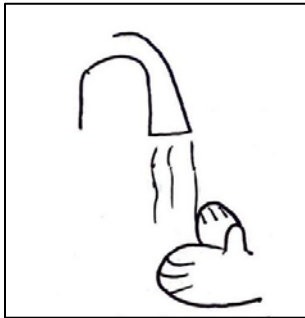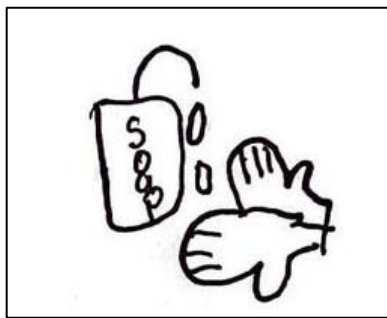
| Wet hands | Put soap on hands | Rinse soap off hands |

| Dry hands |
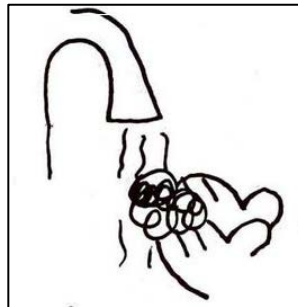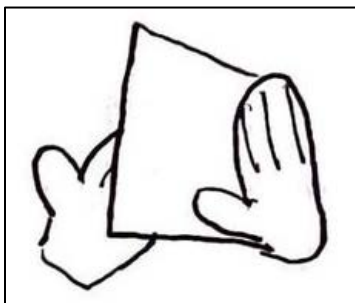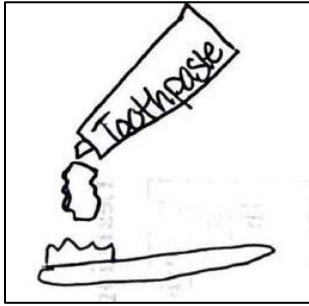
Teeth Brushing:

Place toothpaste on toothbrush
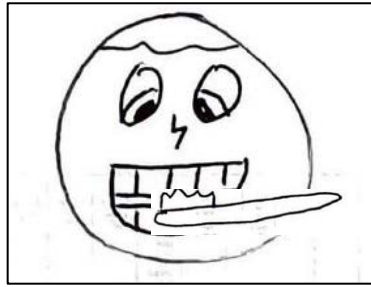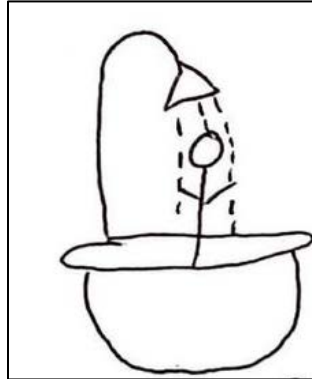

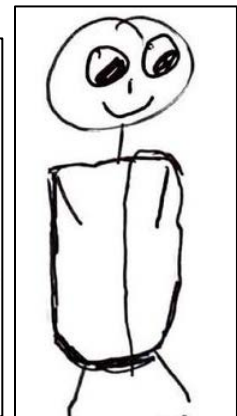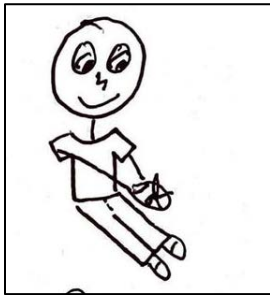Brush Teeth
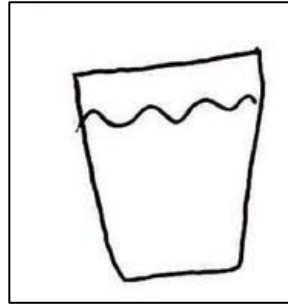
Rinse mouth
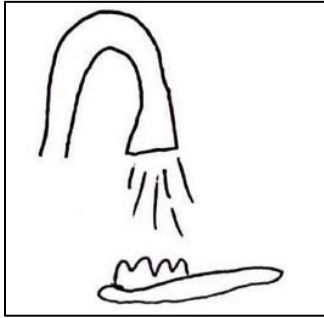
Rinse toothbrush

Taking a shower:
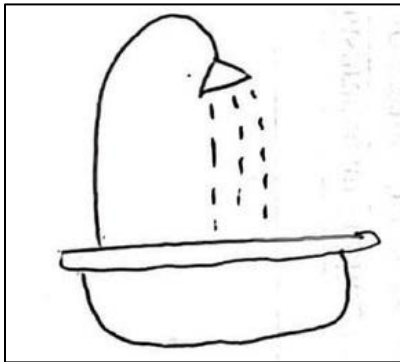
Turn on water
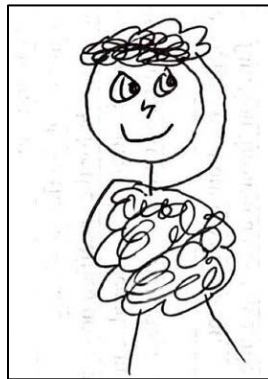
Wash self

Rinse self

Dry self

Five Step Practice Chart

Step 1	Step 2	Step 3	Step 4	Step 5

Step 1	Step 2	Step 3	Step 4	Step 5

Picture Bank for Five Step Sequencing Chart
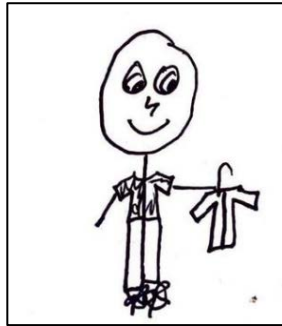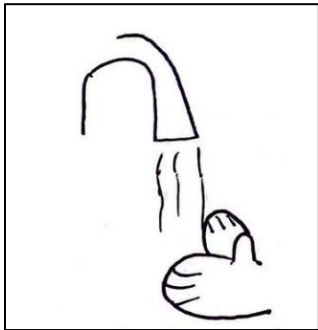
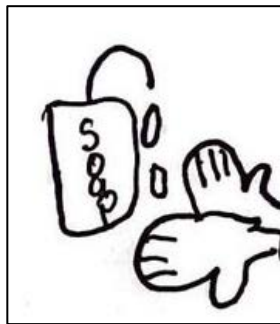## Getting Dressed:
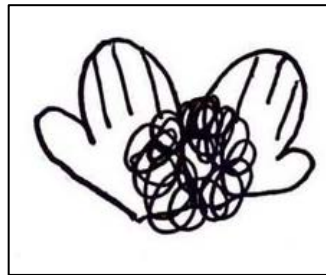

Put on shirt

Put on pants

Put on socks

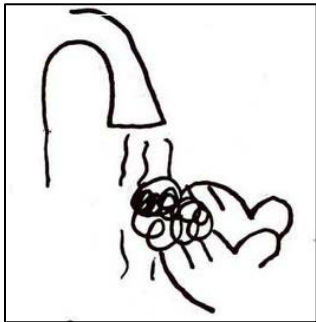Put on shoes

Put on jacket

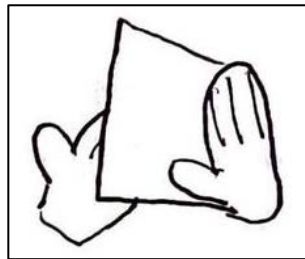## Handwashing:

Wet hands

Put soap on hands

Scrub hands together with soap
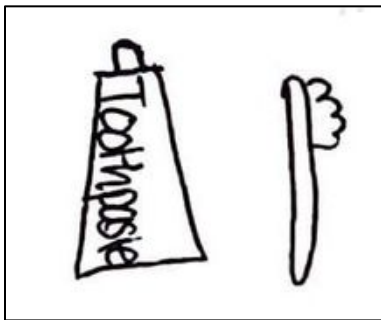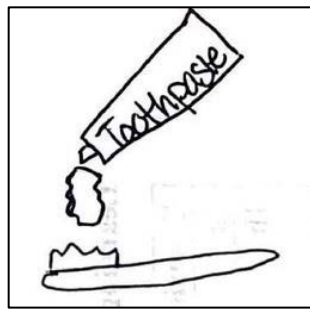
Rinse soap off hands
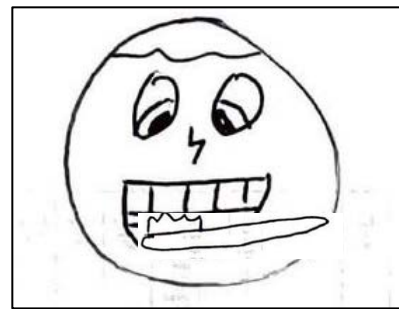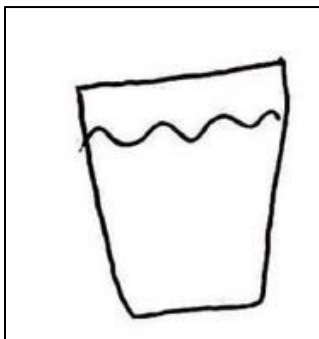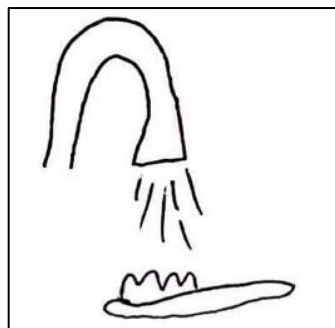

Dry hands

Teeth Brushing:

Find toothbrush and toothpaste

Place toothpaste on toothbrush

Brush teeth

Rinse mouth

Rinse toothbrush

Taking a Shower:
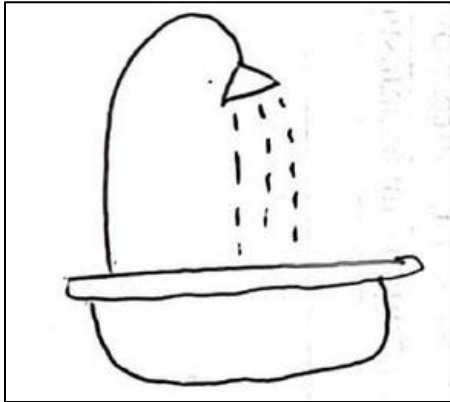
Turn on water
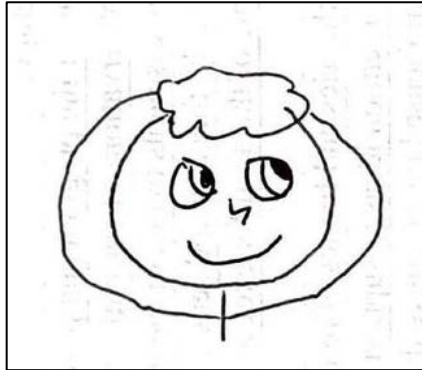
Wash hair
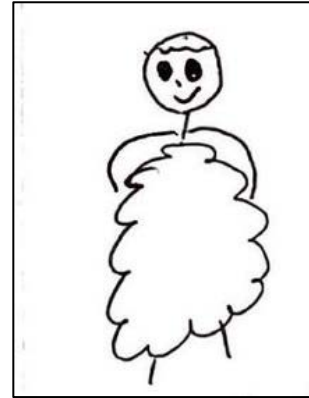
Wash body
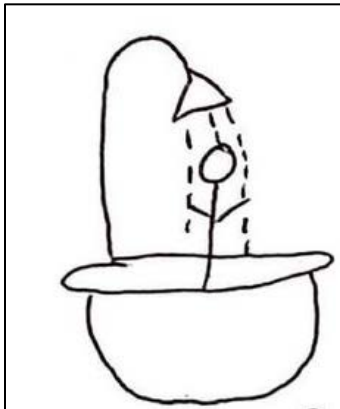
Rinse self
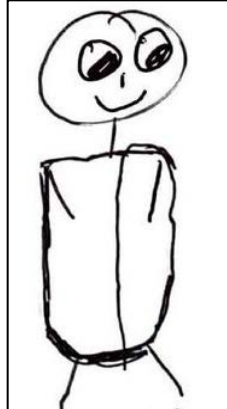
Dry self

<u>Checklist</u>

EHP Intervention Approach: Adapt/Modify

Description: Checklist are an intervention tool that can be used to assist children in completing a variety of tasks. Checklists can easily be adapted to meet the needs of the child.

Instructions:

1. Provide a description of a checklist to the child
2. Work with the child to identify tasks they have to complete on a daily basis.
3. Write down each step/activity that needs to be completed associated with the task.
4. Decide on a way to mark in the box (stickers, check marks, coloring, etc.)
5. Mark each box upon completion of the step/activity.
6. Once all steps have been marked off the checklist is completed.
7. Provide education to parents for use at home.

Required Materials:

1. Checklist
2. Marker/Pen/Pencil
3. Stickers if applicable

Space Demands:

1. Tabletop for writing out each step/activity to be completed.
2. A room free of noise to allow for increased attention to the task.
3. A place in the environment close to the location of where the task will be completed.

Body Functions:

1. Executive Functions
   a. Planning
   b. Organizing
   c. Sequencing
   d. Working memory
   e. Attention
2. Sensory Processes
   a. Visual
   b. Auditory

Activity Adaptions:

1. <u>Grade Up:</u> To grade this activity up, the therapist can incorporate more steps/activities to be completed on the checklist. The therapist can also require the child to write out the checklist on their own.

2. <u>Grade Down:</u> To grade this activity down, the therapist can decrease the number of steps/activities on the checklist. The therapist can also write out the steps/activities for the child.

Hand Washing Three Step Checklist

☐ Water/Soap on hands
_____

☐ Rinse hands with water
_____

☐ Dry hands
_____

Three Step Checklist

Hand Washing Four Step Checklist

☐ Wet hands

☐ Get soap on hands

☐ Rinse hands with water

☐ Dry hands

Four Step Checklist

Hand Washing Five Step Checklist

☐ Rinse hands under water

☐ Apply hand soap to hands

☐ Scrub hands together

☐ Rinse soap off hands

☐ Dry hands

Five Step Checklist

☐ _____

☐ _____

☐ _____

☐ _____

☐ _____

<u>Build a Story</u>

EHP Intervention Approach: Establish/Restore

Description: This intervention helps children to dive into their imaginations and develop a story using their executive function.

Instructions:

1. The therapist should provide an overview of the activity to the child.
2. Provide the child with the appropriate cards (fill in or picture), the writing template, and the three sets of story assistance prompts. All printouts should be cut out along the provided guidelines.
3. Have the child select a starter, add-in, and finisher they want to utilize in their story.
4. Then have the child write in or select the object card images they would like to use to help develop their story.
5. Once the child has established all the printouts they want to use, they should work with the therapist to create a story.
6. The child or the therapist can write out the story on the provided template.
7. Once the story is complete the therapist and child should read the story out loud to see the creation that was made.

Required Materials:

1. Story starters printout
2. Story add-ins printout
3. Story finishers printout
4. Object cards
5. Fill in object cards
6. Template for writing story
7. Pencil/Pen

Space Demands:

1. This activity requires the child to have a tabletop and chair to sit in while completing.
2. A quiet room will also be beneficial to ensure the child is able to maintain attention to the task.
3. The space should have good lighting to make sure that the child is able to see all of the materials clearly.
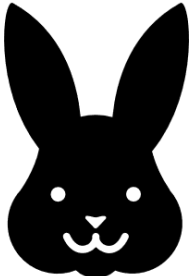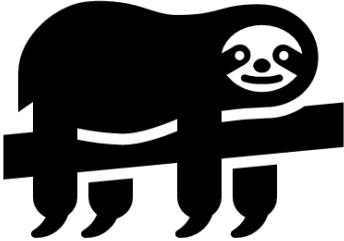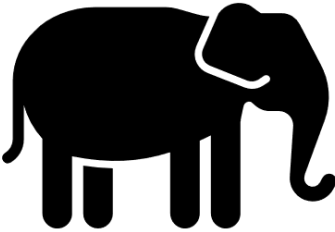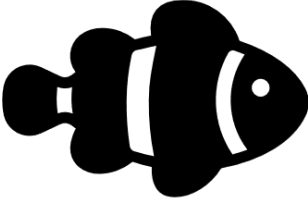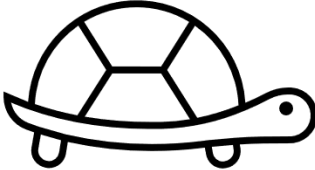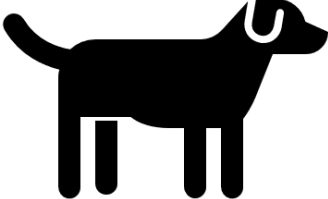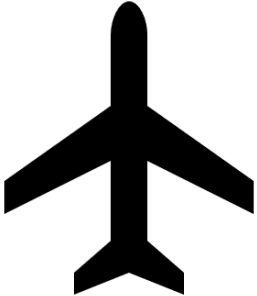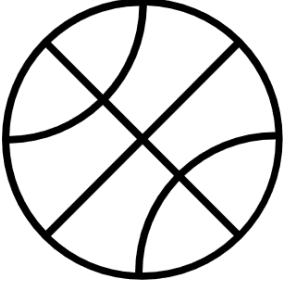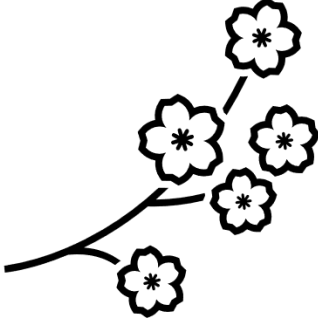
Body Functions:

1. Executive Functions
    a. Working memory
    b. Attention
    c. Sequencing
    d. Planning
    e. Organizing
2. Sensory Processes
    a. Visual
    b. Auditory

Activity Adaptions:

1. Grade Up: To grade this activity up the therapist can ask the child to remember the main details of their story. The therapist can also require the child to produce their own ideas and not use the provided prompts.
2. Grade Down: To grade this activity down the therapist can write out the story for the child. The therapist can also help the child to select prompts and sequence them appropriately.

Object Cards

Fill in Object Cards

Pick an Animal:

Pick a Place:

Pick an Activity:

Pick a Toy:

Pick a Type of Transportation:

Your Choice:

Story Starters

Once upon a time there was a_____

In a land so very far away, there was a_____

It was 100,000 years ago when a_____**appeared**

Deep in the forest, hidden among the plants was a_____

As the summer sun began to rise a little_____**appeared**

There once was a little pond, in the pond there was a_____

I have a_____**it is really quite neat**

Recently I have seen a_____**down by the racetrack**

Disney is a place where all the_____**go**

There sitting in the grass was a_____

Create your own starter_____

Story Add-ins

They were driving

a_____

The_____rode on the_____

They enjoyed some of their favorite_____

It all looked like_____

The castle was just over the_____

I wanted to see the _____ that was hiding in plain sight.

The snow kept falling all over the _____

Story Finishers

That is how the story went.

They all ended up in the same place they started.

It was the most happy ending that ever did exist.

They all became the best of friends.

This was the greatest adventure that anyone could experience.

It was nothing like they had expected.

This would be a story that would never be forgotten.

Write Out my Story

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Follow the Rules

EHP Intervention Approach: Establish/Restore

Description: This activity allows children to draw out a place specifically created by them and develop a story to go along with it.

Instructions:

1. Provide instructions to the child about the activity.
   a. Read the rules provided on the drawing sheet. These rules determine the items that should be included in the picture.
   b. Utilize the brainstorming sheet prior to drawing to write down any thoughts and ideas that you may want to include in your picture.
   c. Once you complete the brainstorming sheet, draw your picture in the box provided.
   d. Once you are done following all rules to complete the drawing, develop a story about your picture.
2. Provide the brainstorming sheet and the rules/drawing sheet.
3. Once completed provide a lined sheet of paper for the child to write down their story on.
4. Once all sheets are completed the activity is finished.

Required Materials:

1. Brainstorming sheet
2. Rules/Drawing sheet
3. Lined story writing sheet
4. Pen/pencil
5. Markers/Crayons/Colored pencils

Space Demands:

1. A table with a chair for the child to sit at while they complete the activity.
2. A quiet room with limited distractions is beneficial to help the child maintain attention to task.

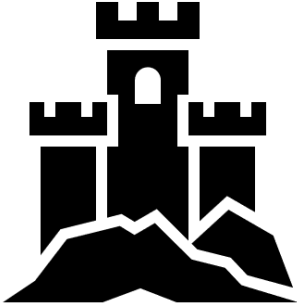**Body Functions:**

1. Executive Functions
   a. Working memory
   b. Organization
   c. Planning

        d. Attention
  2. Sensory Processes
        a. Visual
        b. Auditory

Activity Adaptions:

1. <u>Grade Up:</u> This activity can be graded up by increasing the number of rules the child must follow.
2. <u>Grade Down:</u> This activity can be graded down by decreasing the number of rules the child has to follow. The therapist can also write the story out for the child, or not require them to come up with a full story.

Land of Creation Rules:

1. Draw a magical land that you imagine exploring one day.
2. Draw the sky with anything that you can think of.
3. Pick four different animals and draw them into the image.
4. Draw two people doing an activity.
5. Draw any buildings that the animals or people may need in their land.
6. Draw items that exist within your created landscape.
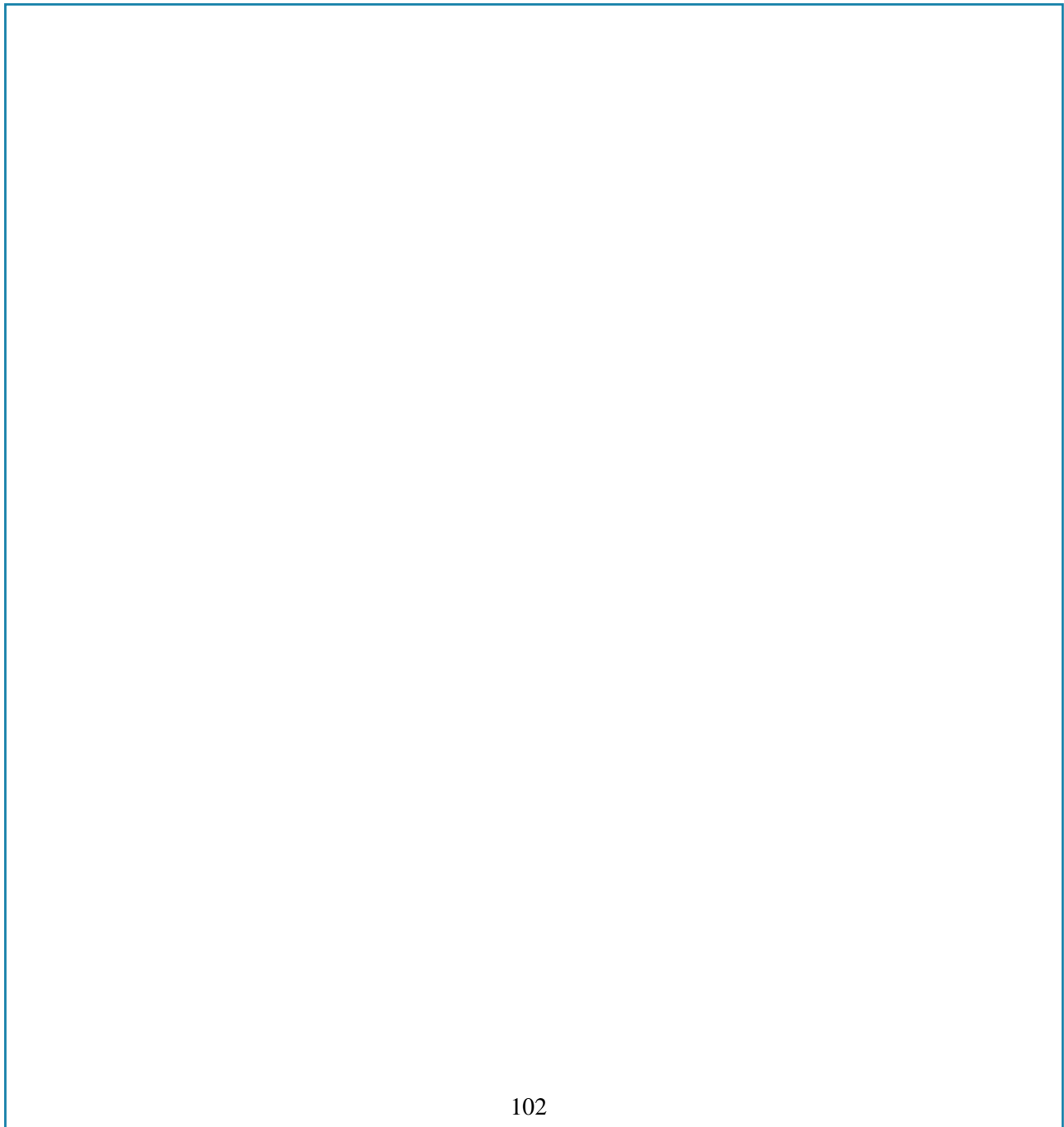
<u>Brainstorming Sheet</u>

<u>Landscape</u>

<u>Skyline</u>

<u>Animals</u>

<u>People</u>

<u>Buildings</u>

<u>Other items</u>

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Space Exploration Rules:

1. Draw an image of space or a landing location.
2. Draw a spaceship or rocket within your picture.
3. Include various items that exist within space.
4. Draw people or animals.
5. Draw any other locations/buildings/or motorized vehicles you see in space.
6. Create something of your own to add to the picture.
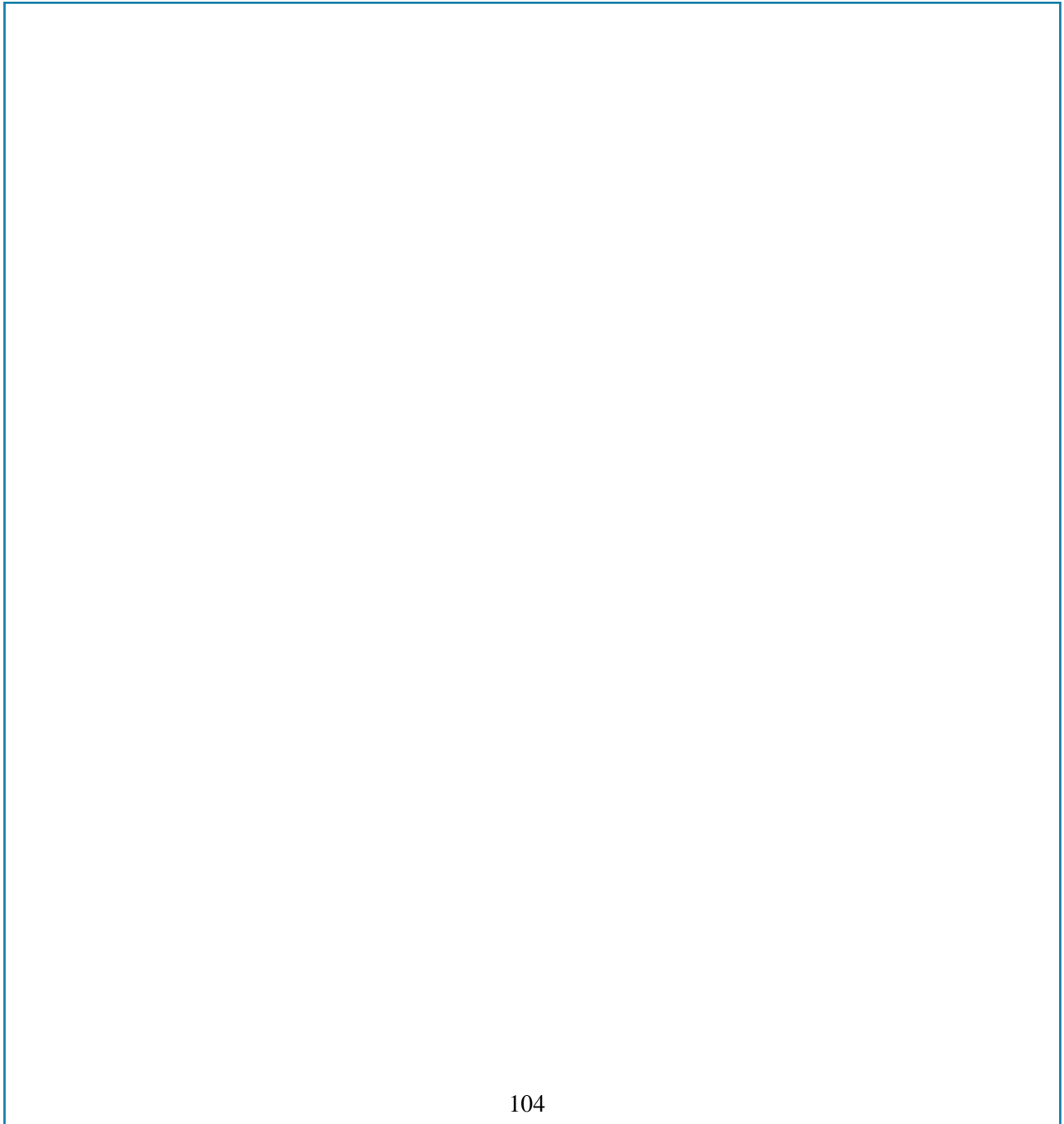
__Brainstorming Sheet__

Space or Landing Location	Spaceship/Rocket/Motorized device

Space Items	People/Animals

Buildings/Additional Locations	Own Creation

Write Out my Story

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Picture Puzzles

EHP Intervention Approach: Establish/Restore

Descriptions: Picture puzzles are a fun way to challenge the child's ability to place an image back together in the correct order. Different picture puzzles are provided in this packet and can be selected based on the identified skill level of the child.

Instructions:

1. Select the most appropriate type of picture puzzle for the child and print it out.
2. Provide the child an overview of the instructions.
    a. Cut along the dotted lines to make multiple squares.
    b. Mix the pieces of the puzzle up on the table.
    c. Grab a second sheet of paper for gluing the pieces on to the puzzle.
    d. The child should select the pieces and place them back in correct order to make the image.
    e. Once the child has recreated the picture in the puzzle, they can begin gluing the pieces down on the provided sheet.
    f. Once all pieces are glued the task is completed. If the child chooses they can color in the puzzle.

Required Materials:

1. Printed picture puzzle
2. Scissors
3. Glue
4. Extra paper
5. Markers/crayons/colored pencils to color

Space Demands:

1. Requires the use of a table with a chair to sit in.
2. The environment should be free of noise and distractions to allow the child to maintain attention to task.

Body Functions:

1. Executive Functions
    a. Attention
    b. Working memory
    c. Sequencing

d. Planning
        e. Organizing
    2. Sensory Processes
        a. Visual
        b. Tactile

Activity Adaptions:

1. <u>Grade Up:</u> This activity can be graded up having the therapist mix up the pieces of the puzzle prior to the start of the activity so the child is unable to refer to the original image. The child could also complete a picture puzzle with an increased number of pieces.
2. <u>Grade Down:</u> This activity can be graded down by having the therapist cut out the pieces of the puzzle. The therapist can also provide a picture puzzle with a decreased number of pieces.

Puppy Dog Puzzle

(Microsoft, 2023c)
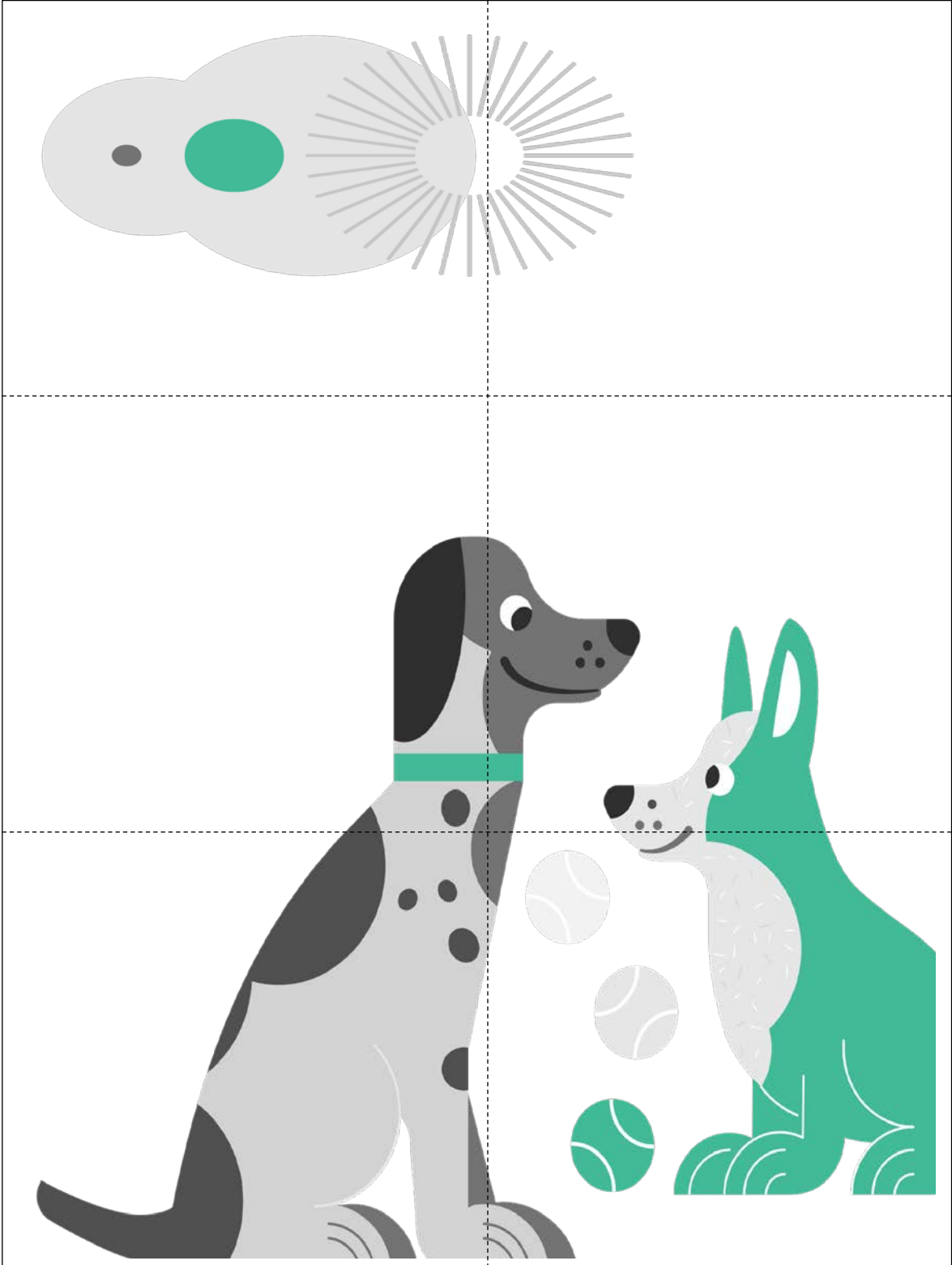
Cupcake Puzzle

Dinosaur Puzzle

(Microsoft, 2023b)
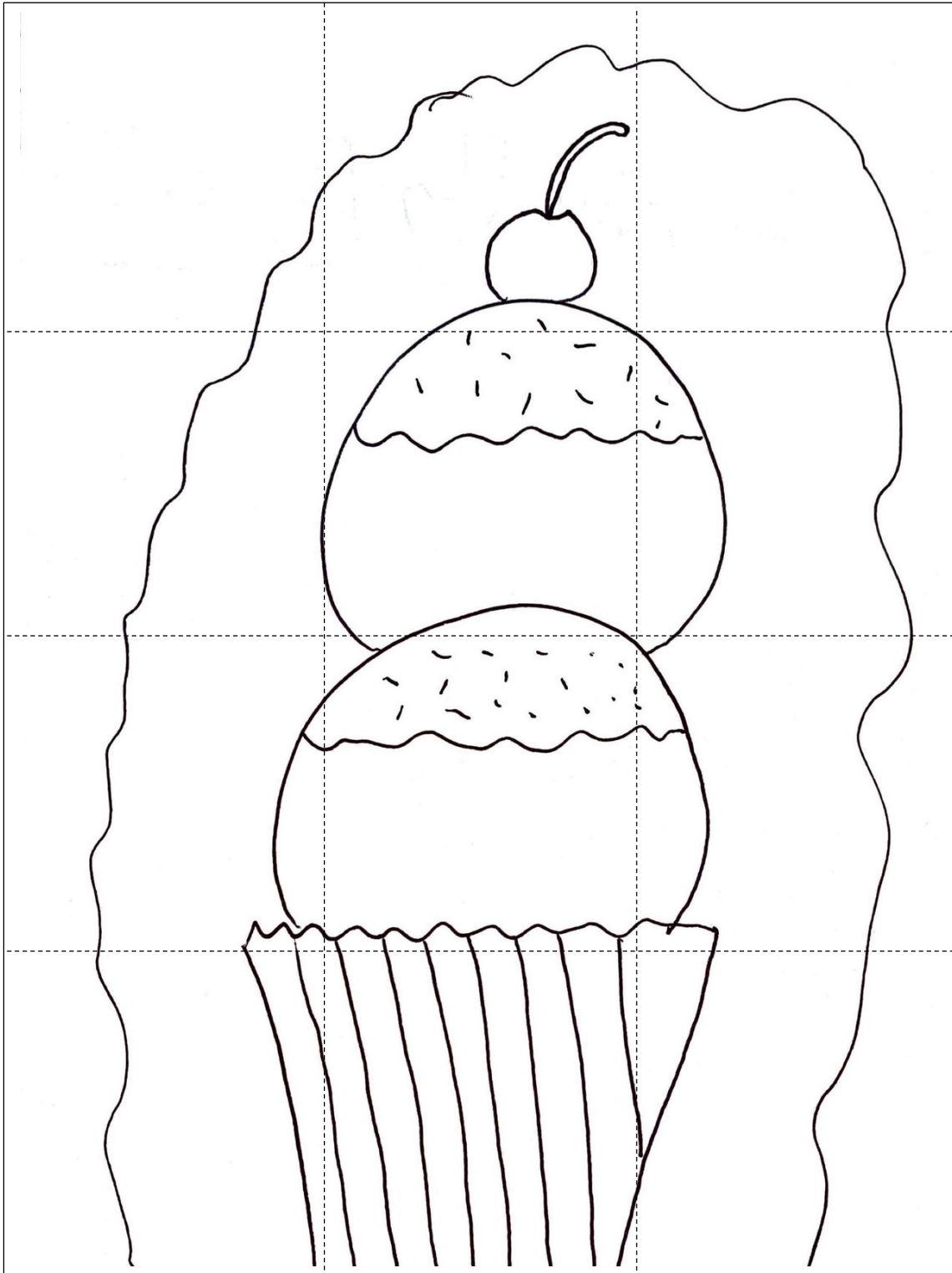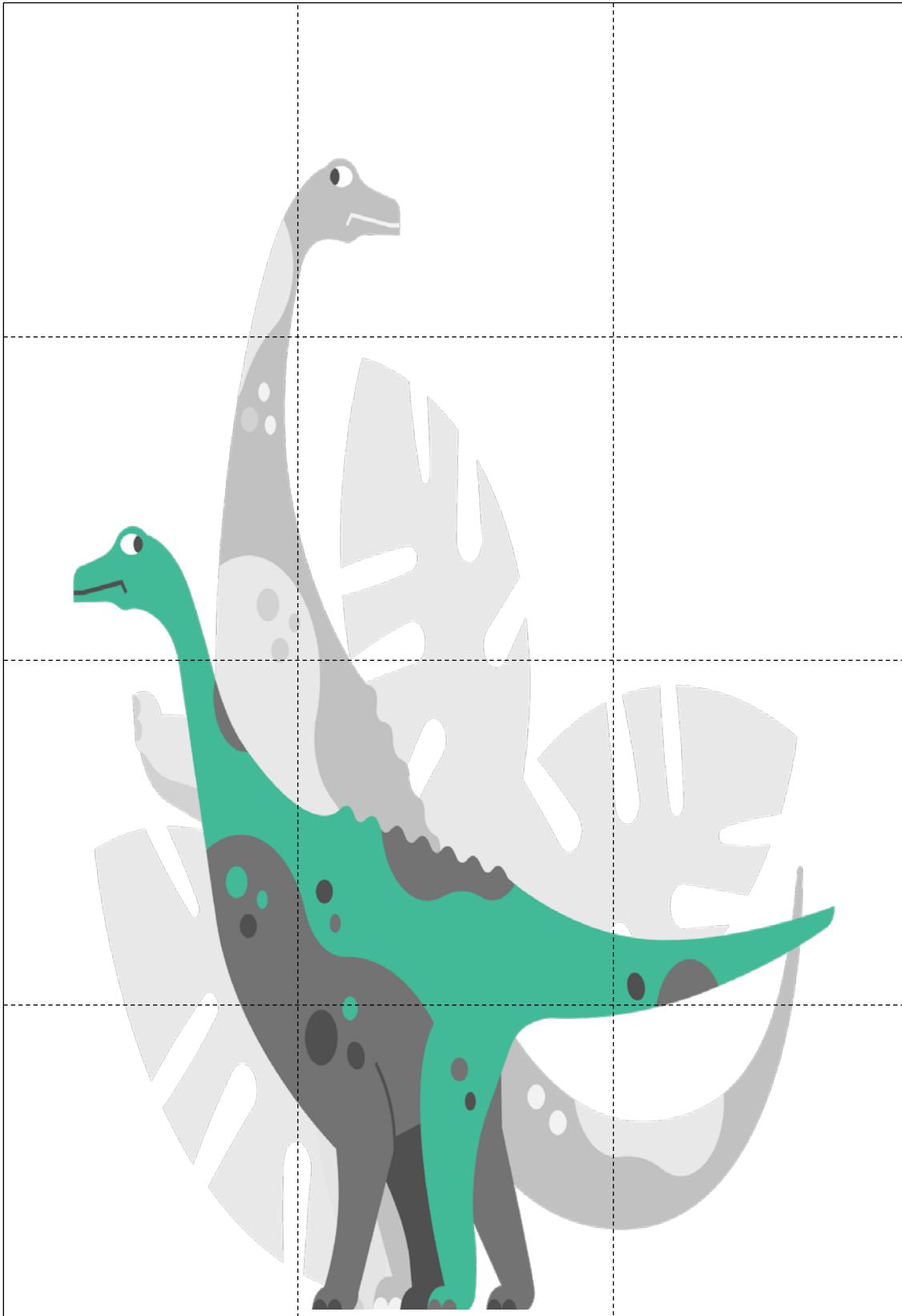
Section 5:

Parent Education Materials for Executive Function

<u>Overview of Parent Education</u>

Parent education materials provide parents with an understanding of the focus area and strategies for targeting executive function, all parent education materials provided in this toolkit are written at an equivalence of 5th grade reading level to accommodate a wide range of literacy levels (Bastable et al., 2020). In providing these materials, parents and caregivers can move along in the process of targeting executive function for their children.

A variety of educational materials were developed that can be printed out and provided to parents. These materials include an overview of occupational therapy, an understanding of executive function, activities that support children with executive dysfunction, changes to the environment for supporting kids with executive dysfunction, and parent resources to further provide education and understanding of executive function.

Occupational Therapy

What is Occupational Therapy (OT)?

Occupational therapists help individuals complete the tasks they need and want to do to improve overall quality of life.

Who do OT's work with?

- Older adults
- Adults
- Young adults
- Adolescents
- School-aged children
- Preschool aged children
- Toddlers
- Infants

WHAT IS OT'S ROLE IN PEDIATRICS?

- WORK ON ACTIVITIES OF DAILY LIVING
- MEETING SENSORY NEEDS
- DEVELOPING FINE AND GROSS MOTOR ABILITIES
- DEVELOPING EXECUTIVE FUNCTION SKILLS
- PROVIDING PARENT EDUCATION

What are considered daily activities in pediatrics?

Daily activities consist of any activity that a child engages in such as sleep, academics, feeding, play, getting dressed, etc.

Who tools do OT's use to support children?

Occupational therapists use programs (zones of regulation, how does your engine run, etc.), visual schedules, toys, art, sensory experiences, feeding, etc. to help children in completing their daily activities successfully.

(American Occupational Therapy Association, 2020; Center on the Developing Child at Harvard University, 2014)

Executive Function

What is Executive Function (EF)?

- Executive Function is higher level thinking abilities that allow children to complete task and meet goals.

Three Subcategories of EF

Inhibition	Cognitive Flexibility	Working Memory
One's ability to stop or refrain from immediate reaction, ignore distractions in the environment, or maintain attention to selected task.	Shift attention between tasks and activities or adapt to changes.	Ability to hold information in the brain for use for completing a task or planning.

Impact of Executive Dysfunction:

When a child has difficulties related to executive function this is referred to as executive dysfunction. This can impact the tasks that a child does on an everyday basis such as schoolwork, play, socialization, and everyday activities.

Importance of EF:

- Establishes the ability to complete task
- Establishes goal development
- Allows for organization and planning
- Increases formation of new ideas and learning

Signs of Executive Dysfunction:

- Difficulty starting a task
- Difficulty remembering steps to a task
- Difficulty placing steps of a task in the correct order
- Impulsivity
- Hard time managing emotions
- Decreased attention during activities

Executive Function Activities

Cermak & Toglia, 2018; Rabinovici et al 2017)

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Play a Board Game	Complete a Movement Activity	Create a Story	Complete a maze
Incorporate following direction games	Complete a craft with multiple steps	Play a Memory Game	Find Hidden Pictures

Tips for Activity Completion

- Break down activity into smaller steps.
- Complete movement breaks between steps or activities.
- Providing cues to the child to help with remembering steps of an activity.
- Utilize a visual timer.
- Utilize a visual schedule for the child to follow.
- Provide the child with simple instructions.

(Center on the Developing Child at Harvard University, 2014)

Executive Function Activities

Board Game Examples:

- Hi Ho Cherry O
- Bop It
- Chess
- Connect Four
- Arcade
- Simon

Games requiring strategy can help to target executive function.

Worksheet/Brain Games:

- Mazes
- Word searches
- Dot to dot
- Sequencing practice charts
- Color by number
- Puzzles

Movement Activities

- Yoga
- Twister
- Obstacle course
- Jumping jacks
- Animals walks
- Wall-pushups
- Simon says
- Carrying heavy loads
- Dance party

Executive Function Supports in the Environment

A child's environment can impact the ability of the child to be successful in completing a specified task. Making changes to the environment can support a child in meeting all goals of determined tasks.

What changes can be made in the home to support executive function?

- If required, sit with child, and utilize cues to assist them with completing tasks
- Break down tasks into smaller steps
- Decrease sounds and sites within the environment to decrease distraction
- Set up a specific workspace free of distraction for the child.
- Allow the child to take breaks and do some movement between steps of a task.
- Allow extra time to complete activities
- Praise efforts that the child makes in completing tasks
- Repeat words you stated to the child if they do not acknowledge them

(Betker, 2017)

Tools/equipment to Support Executive Function

- Provide seating to support focus in their study area (Yoga ball, rocking chair, etc.)
- Provide a fidget the child can use to help them focus on task while moving their hands (stress ball, fidget pen, etc.)
- Utilize checklist to mark off steps completed of task.
- Provide routines and structure (Visual schedules, planners, etc.)
- Label items to help with organization.

(Betker, 2017)
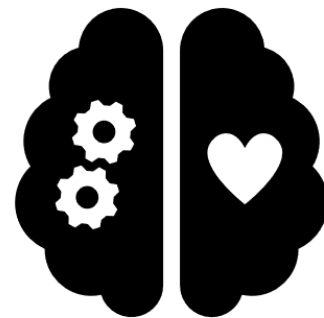
(Microsoft, 2023d)

Resource Guide for Parents

Resource Title	Information	Website
Activities Guide	Provides activities that can be done with children to support executive function abilities.	https://developingchild.harvard.edu/resources/activities-guide-enhancing-and-practicing-executive-function-skills-with-children-from-infancy-to-adolescence/ (Center on the Developing Child at Harvard University, 2014)
Executive Function Strategies	Strategies to support your child in completing daily activities. Includes downloadable resources such as bedtime checklist, goal calendar, organization tips, etc.	https://www.understood.org/en/articles/executive-functioning-issues-strategies-you-can-try-at-home (The Understood Team, 2023)
Executive Function Skills	Overview of the various executive function skills and activities to target.	https://www.theottoolbox.com/executive-functioning-skills/ (The OT Toolbox, 2023)
Executive Function Basics	Information regarding executive function skills and timeline for development.	https://pathways.org/topics-of-development/executive-function/ (Pathways, 2023)

Executive Function Worksheets and Resources	Provides resources for parents, caregivers, and children. Resources can be found for free or purchased, to support children in a large range of executive functions.	https://teacherspayteachers.com (Teachers' Pay Teachers, 2023)
Book Suggestions for Executive Function	A list of books that may be beneficial for parents to utilize when working with their child who has executive dysfunction	• "Late, Lost, and Unprepared: A Parent's Guide to Helping Children with Executive Function by" Joyce Cooper-Kahn and Laurie Dietzel • "The Impulsive, Disorganized Child: Solutions for Parenting Kids with Executive Functioning Difficulties" by James Forgan and Mary Anne Richey • "Smart but Scattered" by Peg Dawson and Richard Guare • "The Whole-Brain Child" by Daniel J. Siegel and Tina Payne Bryson • "Your Child's Growing Mind" by Jane M. Healy (Cooper-Kahn & Dietzel, 2008; Dawson & Guare, 2009; Forgan & Richey, 2015; Healy, 2004; Siegel & Bryson, 2011)

References

Adams, J. N., Feldman, H. M., Huffman, L. C., & Loe, I. M. (2015). Sensory processing in

preterm preschoolers and its association with executive function. *Early Human*

Development, *91*(3), 227–233. https://doi.org/10.1016/j.earlhumdev.2015.01.013

American Occupational Therapy Association. (2020). Occupational therapy code of ethics. *The*

American Journal of Occupational Therapy, *74*(3),

https://doi.org/10.5014/ajot.2020.74S3006

American Occupational Therapy Association. (2020). Occupational therapy practice framework:

Domain and process (4th ed.). *American Journal of Occupational Therapy, 74*(Suppl. 2),

7412410010. https://doi. org/10.5014/ajot.2020.74S2001

Ardila, A. (2013). Development of metacognitive and emotional executive functions in children.

Applied Neuropsychology: Child, *2*(2), 82–87.

https://doi.org/10.1080/21622965.2013.748388

Bastable, S. B., Myers, G. M., & Binion, B. N. (2020). Literacy in the adult client population. In

S. B. Bastable, P. R. Gramet., D. L. Sopezyk., K. Jacobs, & M. M. Braungart (Eds.*),*

Health professional as educator: principles of teaching and learning. (2nd ed. pp 283-

346). Jones & Bartlett Learning.

Barker, E. D., Kirkham, N., Ng, J., & Jensen, S. K. G. (2013). Prenatal maternal depression

symptoms and nutrition, and child cognitive function. *The British Journal of Psychiatry*,

203(6), 417–421. https://doi.org/10.1192/bjp.bp.113.129486

Bethell, C. D., Carle, A., Hudziak, J., Gombojav, N., Powers, K., Wade, R., & Braveman, P.

(2017). Methods to assess adverse childhood experiences of children and families:

Toward approaches to promote child well-being in policy and practice. *Academic Pediatrics*, *17*(7), S51–S69. https://doi.org/10.1016/j.acap.2017.04.161

Betker, C. (2017). Environmental strategies for managing attention deficit hyperactivity disorder. *Journal of Childhood & Developmental Disorders*, *03*(04). https://doi.org/10.4172/2472-1786.100062

Blair, C., & Raver, C. C. (2016). Poverty, stress, and brain development: New directions for prevention and intervention. *Academic Pediatrics*, *16*(3), S30–S36. https://doi.org/10.1016/j.acap.2016.01.010

Calderon, J. (2020, December 16). *Executive function in children: Why it matters and how to help*. Harvard Health. https://www.health.harvard.edu/blog/executive-function-in-children-why-it-matters-and-how-to-help-2020121621583

Center on the Developing Child at Harvard University (2012). *Building the brain's "Air traffic control" system: How early experiences shape the development of executive function: Working Paper No. 11*. Retrieved from www.developingchild.harvard.edu.

Center on the Developing Child at Harvard University (2014). *Enhancing and practicing executive function skills with children from infancy to adolescence.* Retrieved from www.developingchild.harvard.edu.

Center on the Developing Child at Harvard University (2016). *From best practices to breakthrough impacts: A science-based approach to building a more promising future for young children and families.* Retrieved from www.developingchild.harvard.edu.

Cermak, S. A., & Toglia, J. (2018). Cognitive development across the lifespan: Development of cognition and executive functioning in children and adolescents. In N. Katz, & J. Toglia

(Eds), *Cognition, occupation, and participation across the lifespan.* (4th ed., pp 9-28). AOTA Press.

Cooper-Kahn, J., & Dietzel, L. C. (2008). *Late, lost and unprepared: a parents' guide to helping children with executive functioning*. Woodbine House.

Critz, C., Blake, K., & Nogueira, E. (2015). Sensory processing challenges in children. *The Journal for Nurse Practitioners*, *11*(7), 710–716. https://doi.org/10.1016/j.nurpra.2015.04.016

Dawson, P., & Guare, R. (2009). *Smart but scattered: The revolutionary "executive skills" approach to helping kids reach their potential*. Guilford Press.

de Greeff, J. W., Bosker, R. J., Oosterlaan, J., Visscher, C., & Hartman, E. (2018). Effects of physical activity on executive functions, attention and academic performance in preadolescent children: A meta-analysis. *Journal of Science and Medicine in Sport*, *21*(5), 501–507. https://doi.org/10.1016/j.jsams.2017.09.595

Demetriou, E. A., DeMayo, M. M., & Guastella, A. J. (2019). Executive function in autism spectrum disorder: History, theoretical models, empirical findings, and potential as an endophenotype. *Frontiers in Psychiatry*, *10*, 753. https://doi.org/10.3389/fpsyt.2019.00753

Diamond, A., & Ling, D. S. (2016). Conclusions about interventions, programs, and approaches for improving executive functions that appear justified and those that, despite much hype, do not. *Developmental Cognitive Neuroscience*, *18*, 34–48. https://doi.org/10.1016/j.dcn.2015.11.005

Dunn, W., Brown, C., & McGuigan, A. (1994). The ecology of human performance: A

framework for considering the effect of context. *The American Journal of Occupational*

Therapy, *48*(7), 595–607. https://doi.org/10.5014/ajot.48.7.595

Dunn, W. (2014). *Sensory Profile 2: User's Manual.* Pearson.

Dunn, W. (2017). The ecological model of occupation. In J. Hinojosa, P. Kramer, & C. B.

Royeen (Eds), *Perspectives on human occupation: Theories underlying practice.* (2nd ed.,

pp 207-235). F.A. Davis Company.

Forgan, J. W., & Richey, M. A. (2015). *The impulsive, disorganized child: solutions for*

parenting kids with executive functioning difficulties. Prufrock Press Inc..

Galiana-Simal, A., Vela-Romero, M., Romero-Vela, V. M., Oliver-Tercero, N., García-Olmo,

V., Benito-Castellanos, P. J., Muñoz-Martinez, V., & Beato-Fernandez, L. (2020).

Sensory processing disorder: Key points of a frequent alteration in neurodevelopmental

disorders. *Cogent Medicine*, *7*(1), 1736829.

https://doi.org/10.1080/2331205X.2020.1736829

Gateley, C. A., & Borcherding, S. (2012). *Documentation manual for occupational therapy:*

Writing SOAP notes. Slack.

Gioia G. A., Espy K. A., Isquith P. K. (2002). *Behavior Rating Inventory of Executive Function,*

Preschool Version (BRIEF-P) Odessa, FL: Psychological Assessment Resources

Gioia, G. A., Isquith, P. K., Guy, S. C., & Kenworthy, L. (2015). *Behavior Rating Inventory of*

Executive Function, Second Edition (BRIEF-2): Professional Manual. PAR.

Healy, J.M. (2004). *Your child's growing mind: Brain development and learning birth to*

adolescence. Broadway Books.

Kavanaugh, B. C., Dupont-Frechette, J. A., Jerskey, B. A., & Holler, K. A. (2017).

Neurocognitive deficits in children and adolescents following maltreatment:

Neurodevelopmental consequences and neuropsychological implications of traumatic

stress. *Applied Neuropsychology: Child*, *6*(1), 64–78.

https://doi.org/10.1080/21622965.2015.1079712

Kingdon, D., Cardoso, C., & McGrath, J. J. (2016). Research review: Executive function deficits

in fetal alcohol spectrum disorders and attention-deficit/hyperactivity disorder - a meta-

analysis. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *57*(2),

116–131. https://doi.org/10.1111/jcpp.12451

Lawson, G. M., Hook, C. J., & Farah, M. J. (2018). A meta-analysis of the relationship between

socioeconomic status and executive function performance among children.

Developmental Science, *21*(2). https://doi.org/10.1111/desc.12529

Leonard, H. C., & Hill, E. L. (2015). Executive difficulties in developmental coordination

disorder: Methodological issues and future directions. *Current Developmental Disorders

Reports*, *2*(2), 141–149. https://doi.org/10.1007/s40474-015-0044-8

Microsoft. (2023a). Animals

Microsoft. (2023b). Dinosaurs.

Microsoft. (2023c). Dogs.

Microsoft. (2023d). Thinking.

Miller, L. J. (2006). *Miller Function and Participation Scales.* Pearson.

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., Houts, R.,

Poulton, R., Roberts, B. W., Ross, S., Sears, M. R., Thomson, W. M., & Caspi, A.

(2011). A gradient of childhood self-control predicts health, wealth, and public safety.

Proceedings of the National Academy of Sciences, *108*(7), 2693–2698.

https://doi.org/10.1073/pnas.1010076108

Nejati, V. (2021). Program for attention rehabilitation and strengthening (PARS) improves

executive functions in children with attention deficit- hyperactivity disorder (ADHD).

Research in Developmental Disabilities, *113*, 103937.

https://doi.org/10.1016/j.ridd.2021.103937

Pastor-Cerezuela, G., Fernández-Andrés, M.-I., Sanz-Cervera, P., & Marín-Suelves, D. (2020).

The impact of sensory processing on executive and cognitive functions in children with

autism spectrum disorder in the school context. *Research in Developmental Disabilities*,

96, 103540. https://doi.org/10.1016/j.ridd.2019.103540

Pathways. (2023). Executive function. Retrieved from https://pathways.org/topics-of-

development/executive-function/

Raver, C. C., Blair, C., & Willoughby, M. (2013). Poverty as a predictor of 4-year-olds'

executive function: New perspectives on models of differential susceptibility.

Developmental Psychology, *49*, 292–304. https://doi.org/10.1037/a0028343

Reising, M. M., Bettis, A. H., Dunbar, J. P., Watson, K. H., Gruhn, M., Hoskinson, K. R., &

Compas, B. E. (2018). Stress, coping, executive function, and brain activation in

adolescent offspring of depressed and nondepressed mothers. *Child Neuropsychology*,

24(5), 638–656. https://doi.org/10.1080/09297049.2017.1307950

Sames, K. (2015). *Documenting occupational therapy practice.* Pearson.

Schoorl, J., van Rijn, S., de Wied, M., van Goozen, S., & Swaab, H. (2018). Boys with

oppositional defiant disorder/conduct disorder show impaired adaptation during stress:

An executive functioning study. *Child Psychiatry and Human Development*, *49*(2), 298–307. https://doi.org/10.1007/s10578-017-0749-5

Siegel, D. J., & Payne Bryson, T. (2011). *The whole-brain child: 12 revolutionary strategies to nurture your child's developing mind.* Bantam Books.

Snyder, H. R., Miyake, A., & Hankin, B. L. (2015). Advancing understanding of executive function impairments and psychopathology: Bridging the gap between clinical and cognitive approaches. *Frontiers in Psychology*, *6*. https://www.frontiersin.org/articles/10.3389/fpsyg.2015.00328

Teachers Pay Teachers. (2023). Retrieved from https://www.teacherspayteachers.com/

The OT Toolbox, (2023). *Executive function.* Retrieved from https://www.theottoolbox.com/executive-functioning-skills/

The Understood Team. (2023). *Executive function strategies for your child.* Retrieved from https://www.understood.org/en/articles/executive-functioning-issues-strategies-you-can-try-at-home

Thomas, H. (2015). *Occupation-based activity analysis.* 2nd Edition, SLACK.

Toglia, J. (2015). The weekly calendar planning activity: A performance measure of executive dysfunction. AOTA Press.

Turnbull, K., Reid, G. J., & Morton, J. B. (2013). Behavioral sleep problems and their potential impact on developing executive function in children. *Sleep*, *36*(7), 1077–1084. https://doi.org/10.5665/sleep.2814

VORT. (2006). *Hawaii Early Learning Profile 0-3*.

VORT. (2010). *Hawaii Early Learning Profile 3-6*

Wilkes-Gillan, S., Bundy, A., Cordier, R., & Lincoln, M. (2014). Evaluation of a pilot parent-
delivered play-based intervention for children with attention deficit hyperactivity
disorder. *The American Journal of Occupational Therapy: Official Publication of the
American Occupational Therapy Association*, *68*(6), 700–709.
https://doi.org/10.5014/ajot.2014.012450

Zelazo, P. D., Blair, C. B., & Willoughby, M. T. (2016). Executive function: Implications for
education. NCER 2017-2000. In *National Center for Education Research*. National
Center for Education Research. https://eric.ed.gov/?id=ED570880