The Little Brain That Could: Understanding Executive Function in Early Childhood

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Mary is an early childhood teacher in an inclusive, preschool program for children 3 to 5 years old. Mickey is a 4-year-old who often flits from one activity to another and has difficulty with transitions. Mary spoke to Mickey's mother, Sarah, about an evaluation with the early childhood special education (ECSE) teacher who works with the program. When Sarah heard this request, she sighed. Mickey was born at 29 weeks gestation and weighed just under1,200 g (about 2.5 lbs.). Sarah explained to Mary that Mickey was originally referred to Early Intervention (EI) when he was in the Neonatal Intensive Care Unit (NICU) and scheduled to be discharged home.

The EI team evaluated Mickey, and did not find him eligible for EI services based on standardized tests and observation. Although he should qualify under a "medical" condition in her state, team members told Sarah that Mickey did not need services because he was doing well across all areas of development for his corrected age. Now, at 4 years of age, Mickey seems to be having difficulty paying attention, staying on task, and inhibiting inappropriate behaviors such as taking toys from other children. Sarah felt like saying, "I could have told you so!" but bit her tongue instead.

Sarah had recently attended a meeting for parents of babies who were born preterm and had heard about executive function (EF) deficits in school-aged children who were born early. She wondered if Mickey could have those deficits and if they all worked together with him to learn specific executive function skills, maybe he would do better in the classroom and in the community.

Executive function (EF) refers to a group of neurocognitive processes that direct, connect, and organize information in the brain, which is then manifested in planned behavior (Riggs, Jahromi, Razza, Dillworth-Bart, & Müller, 2006). The development of EF skills are associated with complicated interrelated neural network systems, including but not specific to the prefrontal cerebral cortex part of the brain (Collette et al., 2005; Diamond, 2006). Simply put, brain regions associated with EF enables a person's self-regulatory processes (Riggs et al. 2006). Researchers have argued whether EF is a unitary construct (Baddeley, 1990) or a set of cognitive processes interacting together in an interactive framework (Miyake et al., 2000). However, most researchers agree that cognitive

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processes including working memory, initiating and inhibiting responses, shifting among information and maintaining attention during goal-oriented task completion, planning and organizing, and modulating emotional responses are some of the components of EF exhibited by preschoolers (Blair, Zelazo, & Greenberg, 2005; Garon, Bryson, & Smith, 2008).

The importance of developing these skills in the young child cannot be understated. In one Head Start study, children who demonstrated a lack of self-regulation in structured learning situations, had lower literacy scores and end of year cognitive skills in kindergarten and first grade (Bulotsky-Shearer, & Fantuzzo, 2011). EF skills are critical building blocks for later cognitive and social capabilities (Center on the Developing Child at Harvard University, 2011).

Adults can help scaffold early learning experiences to strengthen EF skills or buffer EF deficits (Blasco, 2008). For example, an infant as young as 8 months demonstrates early EF skills when playing peek-a-boo. The adult scaffolds the interaction by showing the infant how he or she hides behind a cloth or scarf. The adult removes the cloth and says, “Peek-a-boo.” After the infant becomes familiar with the game, the adult puts the cloth over the infant’s face and waits for the child to remove the cloth. Most infants will do so and smile as the adult says, “Peek-a-boo!” Many infants demonstrate memory for the game and will attempt to rehide behind the cloth and then pull it away with a big smile.

EF provides the young child with the skills necessary to (a) identify a problem, (b) develop a plan, and (c) use attention and memory skills to set goals and manage actions. The development of EF skills begin in infancy and continue through late adolescence (Best & Miller, 2010). Adults use EF skills to undertake everyday tasks throughout daily routines. An example of an EF skill in an adult is cognitive shifting that allows one to flow between task components. However, sometimes even adults make errors in shifting. For example, have you ever seen an adult who routinely uses an iPad use his or her finger to scroll on a laptop screen?

Infants and toddlers (birth to 2 years old) are capable of EF skills that include initiation, working memory, and beginning inhibition. For example, the child may pause and look at the adult when he or she says “No.” Typically developing preschool children (3-5 year olds) are capable of a full range of EF skills including shift, planning, and organizing. Their ability to follow multi-step directions and goal-directed tasks prepare them for later academic work. (Kraybill & Bell, 2013).

For a child demonstrating EF deficits, self-regulation, including organizing herself, planning how to complete tasks, managing behavior, and even starting tasks are likely to be compromised. The resulting frustration and inability to cope effectively significantly challenges a child’s overall development across domains. The development of EF skills is becoming a particularly relevant topic for younger children as current research has shown early childhood and particularly the first 3 years to be a time of rapid EF growth (Zelazo & Müller, 2002). This coincides with a time period

during which the first indications of developmental disabilities and/or mental health concerns may arise. Early identification and intervention of these deficits are important for a child's social competence and development of school readiness skills (Carlson, Moses, & Claxton, 2004).

Deficits in EF have also been associated with a number of disabilities among the school-age population including Attention Deficit Hyperactivity Disorder (ADHD), learning disabilities, and behavioral concerns (Avirett & Maricle, 2011). It is clear from the literature that children with EF deficits have difficulty with basic academic skills in reading, mathematics, and writing (Bull, Espy, & Wiebe, 2008; Bull & Scerif, 2001; Henry, Messer, & Nash, 2012; Marzocchi et al., 2008; Reiter, Tucha, & Lange, 2004).

Professionals in early intervention (EI) and early childhood special education (ECSE) have only recently begun to understand the importance of EF skills for young children with disabilities and particularly in preparing preschoolers for school. Although there is an emerging literature base on preschoolers with developmental disabilities and EF (Daunhauer & Fidler, 2013), there are no practical guidelines for professionals in the EI and ECSE field. In this article, we review the literature on EF related to low birth weight (LBW) and self-regulation, discuss an EF assessment protocol, and suggest activities to develop and strengthen EF skills and ameliorate or buffer EF deficits. The focus on children who are born with LBW was deliberate because (a) these young children are vulnerable for EF deficits and for exposure to environmental risks including poverty and (b) there is a more established body of literature on this population of children who are at-risk for developmental delay and disabilities (Blasco et al., 2012).

Low Birth Weight and EF Deficits

In major studies of children who were diagnosed with learning deficits during school age, researchers found that a contributing factor was LBW (≤2,500 g). Researchers noted that these children are at significant risk for learning disabilities during school age even when they have no other diagnosed disabilities such as cerebral palsy (Anderson & Doyle, 2003; McCormick et al., 2006; McGrath & Sullivan, 2002). Stanton-Chapman, Chapman, and Scott (2001) suggested that early evaluation and intervention can be effective tools for reducing the incidence of learning disabilities in the school-age population. Researchers have also linked attention problems, internalizing behavioral concerns, and poor EF skills with children who were born with very low birth weight (VLBW; ≤1,500 g) and very preterm (≤33 weeks gestation). These children

were found to have moderate to severe deficits in academic achievement (Aarnoudse-Moens, Smidts, Oosterlaan, Duivenvoorden, & Weisglas-Kuperus, 2009).

Unfortunately, children who are born preterm (≤37 weeks) and LBW may not meet eligibility requirements in many states for Part C services despite the fact that they are at an increased risk for EF deficits. For example, not all states define LBW as a medical condition that satisfies criteria for EI. There is also a wide variability in state definitions for LBW. According to the Early Childhood Technical Assistance Center (ECTA), some states use ≤2,500 g as the criterion for a medical condition while other states use ≤1,200 g as the criterion (Evelyn Shaw, personal communication, February 19, 2012). Indeed, data from the National Early Intervention Longitudinal Study (NEILS; Hebbeler et al., 2007) found only a fraction of the children with LBW are actually being served through EI in the United States. These data are consistent with data from the Centers for Disease Control, which showed that in 2002, only 12% of LBW children were enrolled in EI. Thus, many of these children are in a vulnerable state and may have self-regulation and EF deficits that will later affect school readiness.

Self-Regulation and EF Skills

When children are unable to regulate themselves, they may not be able to make choices or inhibit their behavior. Blair and Razza (2007) found that self-regulation was related to differences in academic outcomes independent of the child's IQ. Furthermore, they noted that inhibitory control was related to early math and reading ability. Recognition of self-regulation issues and intervention before kindergarten is important so children can develop the EF skills necessary to manage social and academic tasks.

Infants, toddlers, and preschool-aged children learn to regulate their emotions through interactions with adults and others. Cassidy, Werner, Rourke, Zubernis, and Balaraman (2003) found preschool-aged children with weak inhibitory control were involved in more negative interactions with their peers than those with good inhibitory control. Young children learn social competence through the development of social skills and the inhibition of undesirable behaviors (e.g., hitting, biting) within the context of their environments including home and center-based programs (Brown, Odom, & McConnell, 2008). For young children with disabilities, EF deficits can result in these children exhibiting challenging behaviors.

Challenging behaviors can be foreseeable reactions to specific antecedent and consequent events (Dunlap et al., 2006). For example, a preschool child throws a tantrum in school when another child plays with the toy he or she wanted. Prevention and intervention for young children with self-regulation difficulty includes helping the child identify the problem, providing solutions, and setting goals to promote emotional regulation.

Interventions that can be applied across situations, at home and in community preschool programs, and effective, evidenced-based interventions have strong implications for future academic and social functioning (Siperstein &

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Favazza, 2008). Because EF skills are an essential component of early development that critically affects social competence and school readiness, children who are at risk for developmental delays are in need of services to ameliorate or buffer the impact of EF deficits. When these children do not qualify for EI, they may be at increasing risk for entry into special education at school age. Children with disabilities, especially ADHD and autism, are known to have EF deficits that affect their ability to succeed at school age.

Measurement of EF Skills

Researchers in early childhood are currently studying EF skills in typically developing preschoolers in settings such as Head Start (Bierman et al., 2008). They are developing measures of EF and a curriculum to guide early childhood teachers in helping all children with EF skill development (Willoughby, Blair, Wirth, & Greenberg, 2010). Other researchers have examined measures of EF for school-age children and attempted to adapt those measures for preschool-aged children (Wiebe, Espy, & Charak, 2008). For example, Drayer (2008) has examined EF skills in young children with autism compared with their typically developing peers (Drayer, 2008). Drayer has found deficits in EF skills for children with autism using measures that are administered individually and adapted from measures used with adults and older children. What is still lacking is a standardized measure of EF in young children. However, new research is underway to develop assessment and curriculum in EF for the general early childhood population (Willoughby et al., 2010).

The Behavior Rating Inventory of Executive Function, Preschool version (BRIEF-P; Gioia, Espy, & Isquith, 2003) is the only current standardized rating scale to measure executive functioning in preschool children (ages 2 to 5 years 11 months). The BRIEF-P uses a survey format completed by the child's parent or caregiver. Components of EF measured by the BRIEF-P include the following subscales: Inhibit, Emotional Control, Plan/Organize, Shift, and Working Memory. The BRIEF-P can be administered to parents and caregivers by professionals who meet Level B qualifications, which is defined as a degree from a 4-year institution in psychology or related field (including education) with coursework in test interpretation, psychometrics, and measurement theory. The survey takes about 15 min for a parent to complete and scores are calculated and interpreted using the manual or the computer software scoring program. Raw scores are transformed into *T* scores ($M = 50$, $SD = 10$), which are then used to interpret the child's level of executive functioning based on age group norms. *T* scores provide information about a child's scores relative to the scores of children in the standardization sample. *T* scores at or above 65 indicate a need or deficit in that area.

EI and ECSE providers wishing to assess potential EF deficits in very young children are likely to find success in using the BRIEF-P to identify specific areas in need of consideration and intervention (Gioia et al., 2003). In addition,

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although EF skills are a relatively new topic in the field, many strategies to improve EF skills can occur in early childhood care and education settings (e.g., private preschool, child care, Head Start) and in the home with support and planning.

Once the BRIEF-P is completed, and in combination with other assessment tools required in the early childhood setting, EI and ECSE providers could address areas of EF skill development that need to be strengthened in the child. If the child qualifies for services, EF skills could be added to their Individualized Family Service Plan (IFSP). In the following section, we discuss the components of EF that can be addressed in early childhood care and education settings. These components are based on the BRIEF-P and are neither inclusive nor exhaustive.

Components of EF

Activities and strategies that support the four components of EF can be integrated in everyday routines and activities and carried out in multiple environments including the home and center-based program. Many of the ideas presented here are not new. What is new is providing focused attention to EF components for young children who have deficits and would benefit from intervention prior to school age. Table 1 contains specific activities for young children based on age (e.g., infant/toddler or preschooler), environment and routine. Each activity includes suggested materials. Care was taken to include current technology that parents often use with their children as well as simple materials that are neither expensive nor difficult to find.

Working Memory

Working memory refers to the ability to hold information in mind and then later recall it (Shing, Lindenberger, & Diamond, 2010). This is a critical component of problem-solving activities, carrying out multistep instructions, and completing basic mental manipulations. Children with limited working memory abilities may have difficulty remembering things even for a few seconds, struggle to keep track of what they are doing as they work, and may forget a simple task that was already learned. Professionals and parents can provide visual supports throughout the day to increase working memory. Visual information in the form of pictures, symbols, and cues can be used to rehearse information from a previous task before continuing with a linked task or to remind the child of his or her daily routines and expectations. To enhance working memory in preschoolers, adults can ask questions during routines, “What do we do next?” “What should you do?” “What do we need?” These questions will help children recall past events and link past solutions to present problems. Some early childhood programs use the High Scope Curriculum that includes a “plan, do, and review” sequence for all children during daily routines and that the teachers review at the end of the day (Hohmann, Weikart, & Epstein, 2008).

Inhibit/Emotional Control

Inhibit refers to a child’s ability to manage his or her behavior in a particular environment (Diamond, Barnett, Thomas, & Munro, 2007). Children with inhibition difficulties can be perceived as being less “in

Table 1
Suggested EF Activities by Age and Component Area

Component of EF	Child's age	Context/routine	Activity	Materials
Working memory	Infant (6 months to 1 year)	Home or community-based setting	Peek-a-boo/with adult; wait and see if the child tries to pull the cloth over his or her own face	Scarves, washcloths
These activities are designed to help increase working memory in all young children in early childhood settings. For children with disabilities, adding prompting systems or visual cues may be necessary.		Home or community-based program/free play or small group activity	A small toy is hidden under 1 of 2 containers then switched to the other container. Add difficulty by rotating the containers.	Containers, small toy such as a block or toy car
	Toddler (1 to 3 years)	Home or community-based program/free play/two child activity	Slide and spin Ask child if they remember what was behind the red knob or "where is the bunny?"	iPad Slide and Spin MyFirstApps.com
		Home or community-based program/free play or small group activity	Pop-up toys Ask the child to find a specific animal such as a bear or tiger	Pop-up toy with familiar characters
	Preschooler (3 to 5 years)	Community-based program/free play/small group or individual activity	Children take turns turning over pictures to find 2 that match. Start with four pictures and increase to 8/10 for older children.	Lotto games Matching picture cutouts place on 4 × 4 squares
		Community-based program/free play/small group or individual activity	Three containers, children decide rules such as all red teddy bears go in one container, all blue teddy bears go in another container and so on. Child must remember which container gets which color.	Plastic small containers, multicolored teddy bears or other item
		Community-based program/free play/small group	Inexpensive copy of a known book. Cut up and scramble pages. Children reorder pages from memory to sequence the story.	Inexpensive children's book, scissors, plastic laminator
		Community-based program/free play/small group	Recite numbers with a 1-s delay between each number and ask the child to repeat them, increase to 3 then 4 numbers	Number cards, audiotape
Inhibition and emotional regulation	Infant (6 months to 1 year)	Home or community-based program/individual or group activity	Caregiver establishes routines such as eating, napping at regular times so child learns to anticipate and regulate their emotions and arousal	Picture charts of routines, table items, bedding

(continued)

Table 1 (continued)

Component of EF	Child's age	Context/routine	Activity	Materials
These activities are designed to help increase working memory in all young children in early childhood settings. For children with disabilities, adding prompting systems or visual cues maybe necessary.		Home or community-based program/individual activity	Caregiver holds infant or toddler in their lap and points to pictures in a book using an active voice. Child directs attention to picture and inhibits desire to close or mouth the book.	Soft or hard toddler book.
		Home or community-based program/free play	Re-direct undesirable behavior such as taking another child's toy. "Look here's a car for you!"	Matching toy cars
	Toddler (1 to 3 years)	Home or community-based program/free play	Child learns to show excitement when finishing a task. Caregiver responds with encouragement. "Good for you, you pushed the button!"	Pop-up toy, Jack in the box
	Preschooler (3-5 years)	Community-based program/ free play or small group activity	Stop, Think, Act—problem-solving strategy	
			Physical activities involving "Stop and Go" or "Red Light, Green Light"	Red and Green shapes, play stop sign
			Targeted praise for an interaction or task, acknowledge feelings, and specific praise when child is moving on.	Pictures of a variety of feelings; happy, excited, sad, angry, frustrated. Feeling Chart—which would include pictures of the feelings listed above.
			Choice boards—Offering child choices that may not be his or her preferred choice.	Choice board, or storyboard with choices on it that child can pick.
Shift	Infant/toddler	Home/community-based setting/individual activity	Infant shifts attention between two toys or two caregivers. For toddlers provide two toys in same play activity.	Two rattles with distinct sounds, two adults talking gently to the child. Two trucks and play gas station or road.
These activities are designed to help increase working memory in all young children in early childhood settings. For children with disabilities, adding prompting systems or visual cues maybe necessary.	Toddler (1 to 3 years)	Home/community-based setting/individual or small group activity	Blow several bubbles toward the child at once. The child tries to catch more than one bubble or pop only one.	Bubbles
	Toddler/preschooler	Home/community-based setting/small or large group activity	Child is giving a 2 minute reminder before it is time to clean up and move to the next routine	Adult reminder, visual cue sign, and/or timer
	Preschooler (3-5 years)	Community-based settings/ small or large group such as circle time	Child claps hands to a specific time (e.g., 2 times), then change the number to 3 times. For older children, change from clap to pat and back to clap.	Musical instruments such as cymbals, or sticks
	Preschooler (3-5 years)	Community-based settings/ individual or small group	Child starts a dot-to-dot picture. Child identifies the picture before connecting all the dots.	Dot-to-dot pictures or home-made drawings.

(continued)

Table 1 (continued)

Component of EF	Child's age	Context/routine	Activity	Materials
	Preschooler (3-5 years)	Community-based settings/ individual or large group such as circle time when children can make a choice for free play	Child adds name to smartboard schedule to play in the block corner next	Smartboard or other visual schedule children's names on felt or Velcro or in corner of smartboard so can be moved to other columns
Planning and organizing	Infant/toddler	Home/community-based setting/individual	Infant reaches for a toy but can't reach it. He or she vocalizes, waves arms to gain adults attention. For a toddler, child uses a step stool to climb up and reach the sink.	Toy out of reach. Adult step stool and adult supervision.
These activities are designed to help increase working memory in all young children in early childhood settings. For children with disabilities, adding prompting systems or visual cues maybe necessary.	Infant/toddler	Home/community-based setting/individual	Child participates in dressing by extending an arm. Child goes to cubby and tries to put on jacket after cue that it's time to go outside.	Shirt or jacket
	Toddler (1 to 3 years)	Home/community-based setting/individual	Adult speaks to child about sequence and steps during routines such as eating or dressing	Plates, napkins, utensils, shirts, pants, socks, and shoes
	Toddler	Home/community-based setting/individual	Toddler sees visual schedule for daily routines posted in a community-based setting	Visual schedule of all routines in the day (e.g., arrival, greet teachers, backpack in cubby, circle time, etc.)
	Preschooler (3-5 years)	Community-based setting/ individual or large group at end of the day	Child places materials into special folder in backpack after a large group review of the day to take home to parents	Child size backpack, special folder or notebook with recorded teacher and parent remarks
	Preschooler (3-5 years)	Community-based setting/ individual or large group	Child places materials in same container after a daily routine.	Specific container for art materials organized by type of material: paper, crayons, scissors, glue, etc.
	Preschooler (3-5 years)	Community-based setting/ individual or large group	Child places blocks back on the correct shelf that is labeled with item name and picture	Shelves that are labeled with name and picture of the item
	Preschooler (3-5 years)	Community-based setting/ individual or small group	Child sets goals getting all materials needed to build a block "road" in the block area	Variety of block sizes, cars, and/or trucks
			Child helps gather all ingredients for a milkshake, then pushes button to activate a blender	For milkshake: Milk, strawberries, banana, blender, adaptive switch for child with a physical disability to active the blender

Note. This table represents activities that can be completed in the home or center-based program for young children. Many of the activities are commonly known and activities that might be unfamiliar are described with more detail. These activities can be used with all children and some include specialized equipment for children with disabilities. EF = executive function.

Table 2
Helpful Resources That Address EF Components at Home and in the Classroom

Print resources
Araujo and Aghayan (2006; CD included).
Johnson-Martin, Attermeier, and Hacker (2004).
Johnson-Martin, Attermeier, and Hacker (2004).
Linder (2008).
Malenfant (2006).
Web resources
Center on the Developing Child at Harvard University. (2011). *Building the brain's air traffic control system: How early experiences shape the development of executive function*. Retrieved from http://www.developingchild.harvard.edu
The Center on the Social and Emotional Foundations for Early Learning (CSEFEL) Children's book list (csefel.vanderbilt.edu/resources/ strategies.html)
Head Start REDI: Research based, developmentally informed. Website for study of executive function in Head Start classrooms. Retrieved from (http://www.headstartredi.ssri.psu.edu).
Measurement of Executive Function in Early Childhood (2013), Retrieved from (http://www.fpg.unc.edu/projects/) measurement-executive-function-early-childhood.
PATHS: Promoting, alternative, thinking strategies curriculum (2012). Retrieved from (http://www.pathstraining.com). Social-emotional curriculum.
Webster-Stratton, C. (2012). *Incredible years: Dina dinosaur's social skills and problem-solving classroom curriculum*. Available from http://www.incredibleyears.com

Note. EF = executive function.

control" of their behavior and may interrupt, say inappropriate things, become restless, and/or be unable to sit still for appropriate periods of time. Environmental structure is a key component in helping children's inhibition difficulties, as too many visual distractions cause opportunities for impulsive behavior. Children with inhibition difficulties may require additional structures in their environment. It is often important to limit visual and auditory distractions for these children and provide a quiet place for them to "regroup" when they are overstimulated. It is also important to realize that children who are considered "shy" often engage in inhibiting behavior that is not as obvious. Professionals can provide opportunities for building confidence through demonstrating acceptance and building self-esteem. Allowing the child to warm up to new activities or situations will help increase appropriate social interactions.

Similarly, emotional control or regulation refers to a child's ability to control frustration or excitement and to think before he or she acts. Children who lack this ability to control their emotions may stay disappointed and upset for long periods of time, have outbursts with

Table 3
Examples of Books, Games, Songs

Executive function component	Sample books, games, and songs
Memory	Garnder, C. (2005). *Farm peekaboo*. New York: Muze. This book includes textures for animals on each page. Songs like Itsy Bitsy Spider using hand movements, puppet spider. Repeat phrases.
	Martin, B. (1983). *Brown bear, brown bear: What do you see?* New York: Henry Holt.
	Cuyler, M. (1991). *That's good that's bad*. New York: Henry Holt.
	Wilson, K. & Chapman, J. Bear Snores On. New York: Simon & Schuster.
Inhibit/self-regulation	Carle, E. (1977). *The grouchy ladybug*. New York: Harpers Collins.
	Goldman, T.H. (2012). *Peas on earth*. NY: Random House.
	Viorst, J. (1972). *Alexander and the terrible, horrible, no good, very bad day*. New York: Aladdin.
	Red/Light Green/Light game
	Duck, Duck Goose game
Shift, planning, and organizing	Simon says (e.g. "Go stand by the door," "Run and then Stop").
	Clean up song
	Mayer, M. (1983). *All by myself*. New York: Golden Books
	Head, Shoulders, Knees, and Toes song
	Songs or poems with repeated phrases. "Old McDonald had a _____."

little provocation, and/or may overreact to small problems. See Table 2 for additional print and web-based resources on supporting EF for young children.

Shift

Shifting refers to a child's ability to change from one set of rules to another (Pennington & Ozonoff, 1996). This is of particular importance in preschool for transitions between activities, ideas, and/or situations. Key aspects include the ability to make transitions, tolerate change, improve flexibility, and the ability to switch or alternate attention. Children with difficulty shifting need consistent routines and help with transitions. Shifting can be easily understood

when considering the teacher phrase, "Use your indoor voices." Young children learn that outside it is okay to be very loud but inside, lower voices are expected. Most children can make this shift without a reminder but some children will need a reminder and some may need a visual cue or direct adult assistance. The well-known children's game, "Simon Says" also teaches children to shift their attention rapidly from one command or directive to another. Another example of shifting is when the child can sort teddy bears by color and then on request, sort the bears by another attribute such as size.

Planning and Organizing

Planning and organizing requires sequencing and stringing together a series of actions and a child's responses to these to achieve a goal. Young children who demonstrate mastery motivation (the ability to achieve a goal-directed task) use planning and organizing skills (Morgan, Wang, Xu, & Liao, 2013). Young children with disabilities often have difficulty with established routines and transitions. Providing a structure for young children to follow, and modeling planning and organizing throughout the day, will help children learn to sequence actions to achieve goals.

See Table 3 for examples of books, games, and songs that support EF for young children.

Summary

Katie told Mary about embedded instruction and they planned to do some attention activities with a small group of children that included Mickey and two children who are currently on IFSP's for challenging behaviors. The goal was to discuss sharing and caring about each other. Mary read the book, "Peas on Earth" during circle time that week. During small group, Katie would also use a ladybug timer to increase the amount of time Mickey and the other children worked at a table together sharing items such as glue and pieces of construction paper before moving to another activity. Mary asked the children to pick a favorite activity once the timer went off. Mickey chose the sand table for play. At art time, the children painted peas on to an earth shape with two children working side by side at the easel. Mary and her assistant wrote down their verbatim comments to share with parents. Mickey wrote, "The peas are sharing their food." His partner added, "The children are happy."

As in the story of the "Little Engine That Could (Piper, 1954), with scaffolding and resources, young children can attempt difficult tasks through planning and setting goals. Professionals and parents can be the team reminding the child "I think I can, I think I can," until he or she reaches "I know I can!" This story parallels the important journey during the preschool years as the child develops and integrates EF capacity.

As noted in the beginning of this article, EFs involve a number of interconnected systems that, when compromised, can result in difficulties that affect a child's ability to perform tasks across early childhood settings including the home and community-based settings. In retrospective research

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studies, researchers have found that a young child's developmental trajectory will be affected when EF skills are not strengthened and deficits are not addressed. Improving outcomes by targeting EF skills in the preschool years has the potential of buffering or ameliorating EF deficits before the child reaches school age. Professionals and families can benefit from an understanding of EF for children with known disabilities as well as for children who may have areas of concern. Although much more research and evidence-based practices are needed across developmental disabilities in young children, it is hoped that with early practice and experience, EF skills can be improved in young children as these abilities are an essential component of school readiness.

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Anderson, P., & Doyle, L. W. (2003). Neurobehavioral outcomes of school-age children born extremely low birth weight or very preterm in the 1990s. *Journal of the American Medical Association, 289*, 3264-3272.

Araujo, N., & Aghayan, C. (2006). *Easy songs for smooth transitions in the classroom*. St. Paul, MN: Redleaf Press.

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