Enhancing and Practicing Executive Function Skills with Children from Infancy to Adolescence



Center on the Developing Child HARVARD UNIVERSITY

Introduction

Executive function and self-regulation skills provide critical supports for learning and development. Just as an air traffic control system at a busy airport manages the arrivals and departures of many aircraft on multiple runways, executive function skills allow us to retain and work with information in our brains, focus our attention, filter distractions, and switch mental gears. There are three basic dimensions of these skills:

For more resources on executive function from the Center on the Developing Child, please go to: developingchild.harvard.edu

- Working memory — The ability to hold information in mind and use it.
- Inhibitory control — The ability to master thoughts and impulses so as to resist temptations, distractions, and habits, and to pause and think before acting.
- Cognitive flexibility — The capacity to switch gears and adjust to changing demands, priorities, or perspectives.

These skills help us remember the information we need to complete a task, filter distractions, resist inappropriate or non-productive impulses, and sustain attention during a particular activity. We use them to set goals and plan ways to meet them, assess our progress along the way, and adjust the plan if necessary, while managing frustration so we don't act on it.

Although we aren't born with executive function skills, we are born with the potential to develop them. The process is a slow one that begins in infancy, continues into early adulthood, and is shaped by our experiences. Children build their skills through engagement in meaningful social interactions and enjoyable activities that draw on self-regulatory skills at increasingly demanding levels.

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In infancy, interactions with adults help babies focus attention, build working memory, and manage reactions to stimulating experiences. Through creative play, games, and schoolwork, children practice integrating their attention, working memory, and self-control to support planning, flexible problem-solving, and sustained engagement. By high school, students are expected to organize their time (largely) independently, keep track of their assignments, and manage projects to completion.

As children develop these capacities, they need practice reflecting on their experiences, talking about what they are doing and why, monitoring their actions, considering possible next steps, and evaluating the effectiveness of their decisions. Adults play a critical role in supporting, or "scaffolding," the development of these skills, first by helping children complete challenging tasks, and then by gradually stepping back to let children manage the process independently—and learn from their mistakes—as they are ready and able to do so.

The activities that follow have been identified as age-appropriate ways to strengthen various components of executive function. Although scientific studies have not yet proven the effectiveness of all these suggestions, their presence here reflects the judgment of experts in the field about activities that allow children to practice their executive function skills. Practice leads to improvement. These activities are not the only ones that may help; rather, they represent a sample of the many things children enjoy that can support healthy development.

Finally, please note that when websites and products are referenced in these activity suggestions, it is because they are helpful resources or examples. Their inclusion does not imply endorsement, nor does it imply that they are the only, or necessarily the best, resources.

Children's executive function and self-regulation skills grow at a fast pace during this period, so it is important to adapt activities to match the skills of each child. Younger children need a lot of support in learning rules and structures, while older children can be more independent. Ultimately, the goal is to shift children away from relying on adult regulation, so when the child seems ready, try to reduce the support you provide.

During intentional imaginary play, children develop rules to guide their actions in playing roles. They also hold complex ideas in mind and shape their actions to follow these rules, inhibiting impulses or actions that don't fit the "role." Players often take ideas from their own lives, such as going to the doctor's office. They might act "sick," be examined by the doctor, and receive a shot. The "doctor" talks and acts like a doctor (calm and reassuring), the "sick child" talks and acts like a sick child (sad and scared), and the child in the role of "parent" talks and acts like a concerned parent (worried and caring). While younger children tend to play alone or in parallel, children in this age range are learning to play cooperatively and often regulate each other's behavior—an important step in developing self-regulation.

Ways to support high-level imaginary play:

to make sure that children know enough about the scenario and roles to support pretend play.

to encourage this type of play. Younger preschoolers may need more realistic props to get the play started (e.g., toy medical kits), while older children can re-purpose other things to turn them into play props (e.g., paper towel tube that is used as a cast for a "broken arm"). Reusing familiar objects in a new way also practices cognitive flexibility.

Children must determine what is needed, hold this information in mind, and then follow through without getting distracted. They also exercise selective attention, working memory, and planning. If the original plans don't work out, children need to adjust their ideas and try again, challenging their cognitive flexibility.

as shown by one early education program designed to build self-regulation, Tools of the Mind. Children decide who they are going to be and what they are going to do before they start playing, and then draw their plan on paper. Planning means that children think first and then act, thus practicing inhibitory control. Planning play in a group also encourages children to plan together, hold these plans in mind, and apply them during the activity. It encourages social problem solving, as well as oral language.

Children love to tell stories. Their early stories tend to be a series of events, each one related to the one before, but lacking any larger structure. With practice, children develop more complex and organized plots. As the complexity of the storytelling grows, children practice holding and manipulating information in working memory.

Ways to support children's storytelling:

and write them down to read with the child. Children can also make pictures and create their own books. Revisiting the story, either by reviewing pictures or words, supports more intentional organization and greater elaboration.

- **Tell group stories.** One child starts the story, and each person in the group adds something to it. Children need to pay attention to each other, reflect on possible plot twists, and tailor their additions to fit the plot, thereby challenging their attention, working memory, and self-control.

- **Have children act out stories** they have written. The story provides a structure that guides children's actions and requires them to attend to the story and follow it, while inhibiting their impulse to create a new plot.

Research indicates that bilingualism can benefit a variety of executive function skills in children of all ages, so fostering fluency in a second language is valuable.

Movement challenges: songs and games

The demands of songs and movement games support executive function because children have to move to a specific rhythm and synchronize words to actions and the music. All of these tasks contribute to inhibitory control and working memory. It is important that these songs and games become increasingly complex to interest and challenge children as they develop more self-regulation skills.

- **Provide many opportunities** for children to test themselves physically through access to materials such as climbing structures, balance beams, seesaws, etc. Setting challenges for children—such as obstacle courses and games that encourage complex motions (skipping, balancing, etc.)—can also be fun. When children are trying new and difficult activities, they need to focus attention, monitor and adjust their actions, and persist to achieve a goal.

Try games that require children to reduce stimulation and focus attention—such as using a balance beam or yoga poses that include slow breathing.

- **Play music** and have children dance really fast, then really slowly. *Freeze dance* is also fun, and it can be made more difficult by asking children to freeze in particular positions. (Tools of the Mind uses stick-figure pictures to direct children.) When the music stops, children must inhibit action and shift their attention to the picture to imitate the shape depicted.

- **Songs that repeat and add** to earlier sections (either through words or motions) are a great challenge to working memory, such as the motions to *She'll Be Coming 'Round the Mountain*, the words to *Bought Me a Cat*, and backward-counting songs, such as *Five Green and Speckled Frogs* and songs repeating a long list (the *Alphabet Song*).

Circle games like *Circle 'Round the Zero* are also fun. Complex actions, including finding partners, must be accomplished without becoming distracted.

Card games are still fun, but now children can be asked to sort by different rules, promoting cognitive flexibility. Children can first sort or match by one rule (such as by color), and then immediately switch to a new rule (such as by shape). For a more challenging version, play a matching game, but change the rule for each pair. *Quirkle* and *S'Match* are commercially available games that challenge cognitive flexibility in this way. Or play a bingo or lotto game, in which children have to mark a card with the opposite of what is called out by the leader (e.g., for "day," putting a chip on a nighttime picture). Children have to inhibit the tendency to mark the picture that matches, while also remembering the game's rule.

Memory games can engage children this age, exercising their visual working memory and planning skills.

Cooking activities for young children. They practice inhibition when waiting for instructions, working memory while holding complicated directions in mind, and focused attention when measuring and counting.

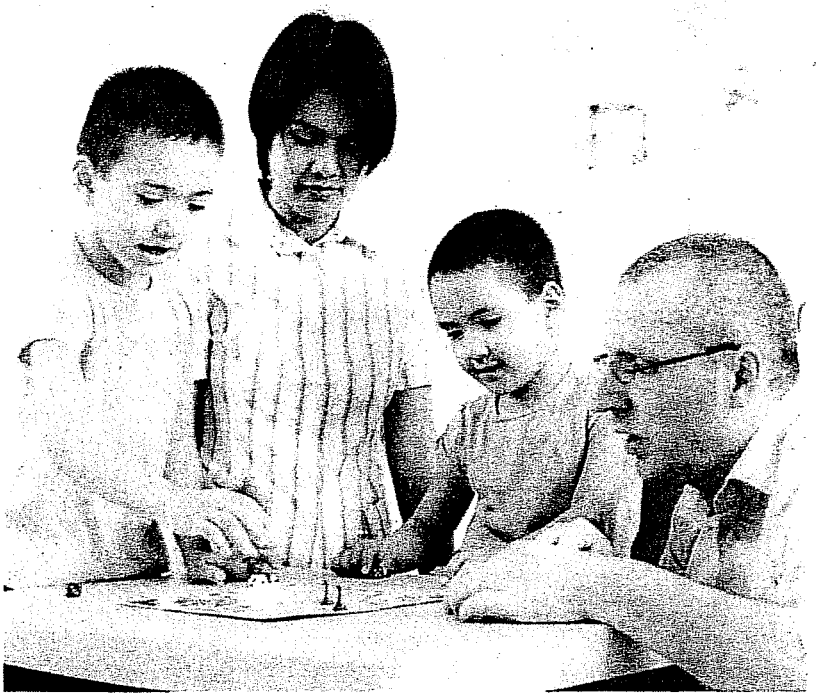
Resources

Tools of the Mind: pretend play suggestions
www.toolsofthemind.org/parents/make-believe-play/

Montessori: Walking on the Line
www.infomontessori.com/practical-life/control-of-movement-walking-on-the-line.htm

Songs
kids.niehs.nih.gov/games/songs/childrens/index.htm

Games can exercise children's executive function and self-regulation skills—and allow them to practice these skills—in different ways. At this age, children start to enjoy games that have rules, but do so with widely varying levels of interest and skill. Since an important aspect of developing these skills is having a constant challenge, it's important to choose games that are demanding but not too hard for each child. As the child players become familiar with these games, try to decrease the adult role as soon as possible; the challenge is greater for children if they remember and enforce the rules independently. Just be prepared with some techniques for negotiating conflict. Flipping a coin or drawing a straw are some methods used by Tools of the Mind, an early education program designed to build self-regulation.



Card games and board games

- Games that require players to remember the location of particular cards are great at exercising working memory. At the simplest level, there are games such as *Concentration*, in which children uncover cards and have to remember the location of matches. At a more complicated level are games that require tracking types of playing cards as well as remembering their locations, including *Go Fish, Old Maid, Happy Families*, and *I Doubt It.*
- Games in which the children match playing cards, either by suit or number, are also good at practicing cognitive flexibility. Examples include *Crazy Eights, Uno*, and *Spoons. Blink* and *SET* are newer card games in which cards can be matched on more than two dimensions.
- Games that require fast responses and monitoring are also great for challenging attention and inhibition. *Snap* and *Slapjack* are card games that fall into this category. *Perfection* draws on similar skills.
- Any board game that involves some strategy provides important opportunities to make and hold a plan in mind for several moves ahead, consider the varying rules that govern different pieces, and adjust strategy in response to opponents' moves. Through strategizing, a child's working memory, inhibitory control, and flexibility have to work together to support plan-based, effective play. *Sorry!, Battleship, Parcheesi, mancala, checkers*, and *Chinese checkers* are some of the many examples of these types of games for children this age.

Physical activities/games

- Games that require attention and quick responses help children practice attention and inhibition. They include *freeze dance (musical statues); musical chairs; Red Light, Green Light;* or *Duck, Duck, Goose* for younger children. Some of these games also require the person who is "It" to mentally track others' movements, challenging working memory as well; these games include *Mother May I?* and *What Time Is It, Mr. Fox?* Others require selective responses and test inhibition, such as the *Magic Word Game*, in which children wait for a "magic word" to start an action.

- Fast-moving ball games, such as *four square, dodgeball,* and *tetherball,* require constant monitoring, rule following, quick decision-making, and self-control.

- *Simon Says* is another great game for attention, inhibition, and cognitive flexibility, as the child has to track which rule to apply and switch actions, as appropriate. Other versions are the Australian *Do This, Do That* or the variation, *Do As I Say (Not As I Do).*

- Children are now old enough to enjoy structured physical activities, such as organized sports. Games that require coordination and provide aerobic exercise, such as soccer, have been shown to support better attention skills. Physical activities that combine mindfulness and movement, such as yoga and Tae Kwon Do, also help children develop their ability to focus attention and control actions.

Movement/sung games

- Copy games, in which the person imitating has to hold in mind the model's actions, draw on working memory. *Punchinella* is one example, with the model watching during the second verse ("I can do it, too"). Call-and-response songs provide a similar auditory challenge, like *Boom Chicka Boom* and *I Met a Bear.*

- Songs that repeat and add on to earlier sections (either through words or motions) also challenge working memory, like the motions to *She'll Be Coming 'Round the Mountain,* or the words to *Bought Me a Cat.* The classic memory games of *Packing for a Picnic* or *Packing a Suitcase for Grandma's* fall in this category, too. Older children can enjoy the added challenge of alphabetizing the list.

- Singing in rounds is a challenge for older children that requires use of working memory and inhibition. *Row, Row, Row Your Boat* is a simple round to start with, but there are many with greater complexity.

- Complicated clapping rhythms also practice working memory, inhibition, and cognitive flexibility, and have been popular with generations of children in many cultures. *Miss Mary Mack* and *Down Down Baby* are familiar examples.

Quiet activities requiring strategy and reflection

- Children become increasingly independent at this age, and puzzle and brain teaser books that include mazes, simple word finds, matching games, etc., exercise attention and problem-solving skills (requiring working memory and cognitive flexibility).

- Logic and reasoning games, in which rules about what is possible need to be applied to solve puzzles, start to become interesting and provide great working memory and cognitive flexibility challenges. ThinkFun, a game and puzzle company, provides some appealing and age-appropriate versions with *Traffic Jam* and *Chocolate Fix,* while *Mastermind* is another old favorite that now has a simpler version for younger children. Educational online game sites provide many similar activities as well.

- Guessing games are also popular and require players to use working memory and flexible thinking to hold in mind previous responses while they develop and discard potential theories. Some examples are *20 Questions* or *Guess My Rule* (often played with blocks of different colors, sizes, and shapes, so that children try to guess which attribute, or set of attributes, defines the rule for the set).

- *I Spy* and the books derived from this game require children to think about categorization and use selective attention in searching for the correct type of object.

Resources

Online games
- *www.coolmath.com*
- *pbskids.org/lab/games*

Game rules
- *www.pagat.com*
- *en.wikipedia.org/wiki/List_of_traditional_children%27s_games*

Fun songs
- *www.scoutsongs.com*

ThinkFun
- *www.thinkfun.com*

Tools of the Mind
- *www.toolsofthemind.org*

Executive Function Activities for 7- to 12-year-olds

These games provide challenges and practice for executive function and self-regulation skills among school-age children. For children in this age range, it is important to steadily increase the complexity of games and activities.

Card games and board games

- Card games in which children have to track playing cards exercise working memory and promote mental flexibility in the service of planning and strategy. *Hearts, spades,* and *bridge* are popular examples.
- Games that require monitoring and fast responses are great for challenging attention and quick decision-making in children at this age. *Spit,* for example, requires attending to your own play as well as your opponents' progress.
- For younger children, card games requiring matching by either suit or number continue to test cognitive flexibility. *Rummy* games, including *gin rummy*, are popular examples. Games with more complicated sets of options, such as *poker* and *mahjong*, may challenge older children.
- Any game involving strategy provides important practice with holding complicated moves in mind, planning many moves ahead, and then adjusting plans—both in response to imagined outcomes and the moves of opponents. With practice, children can develop real skill at classic games of strategy like *Go* or *chess,* while challenging working memory and cognitive flexibility. Many more modern strategy games exist as well. Mensa, the high IQ society, holds a yearly competition testing new games, and provides an interesting list of favorites.
- Children this age also enjoy more complex games involving fantasy play, which require holding in working memory complicated information about places visited in imaginary worlds, rules about how characters and materials can be used, and strategy in attaining self-determined goals. *Minecraft* is a popular computer game of this sort, while *Dungeons & Dragons* is a longtime card-based favorite.

Physical activities/games

- Organized sports become very popular for many children during this period. Developing skill at these games practices children's ability to hold complicated rules and strategies in mind, monitor their own and others' actions, make quick decisions and respond flexibly to play. There is also evidence that high levels of physical activity, particularly activity that requires coordination, like soccer, can improve all aspects of executive function.
- Various jump rope games also become popular among children of this age. Children can become very skilled at *jump rope, double Dutch, Chinese jump rope,* and other such challenges. Developing skill in these games requires focused practice, as well as the attention control and working memory to recall the words of the chant while attending to the motions.
- Games that require constant monitoring of the environment and fast reaction times also challenge selective attention, monitoring, and

continued

inhibition. For younger children, hiding/tag games, particularly those played in the dark, like *flashlight tag* and *Ghost in the Graveyard,* are fun. Older children may enjoy games like *laser tag* and *paintball.* Many video games also provide practice of these skills, but can include violent content, so care should be taken in selecting appropriate options and setting reasonable time limits. Common Sense Media, a non-partisan media information organization, provides useful reviews of popular games.

Music, singing, and dance

- Learning to play a musical instrument can test selective attention and self-monitoring. In addition to the physical skill required, this activity challenges working memory to hold the music in mind. There is also some evidence that the practice of two-handed coordination supports better executive function.
- Whether or not children learn an instrument, participating in music classes or community events can still require them to follow rhythmic patterns, particularly when improvisation is involved (e.g., clapping or drumming). This can challenge their coordination of working memory, attention, cognitive flexibility, and inhibition.
- Singing in parts and rounds, as is done in children's singing groups, is also a fun challenge, requiring a similar coordination of working memory, monitoring, and selective attention. As children's musical skills grow, adults can present them with steadily increasing challenges.
- Dancing, too, provides many opportunities to develop attention, self-monitoring, and working memory, as dancers must hold choreography in mind while coordinating their movements with the music.

Brain teasers

Puzzles that require information to be held and manipulated in working memory can be terrific challenges.

- Crossword puzzles are available for all skill levels and draw on manipulation of letters and words in working memory as well as cognitive flexibility.
- *Sudoku* provides a similar challenge but works with numbers and equations rather than letters and words.
- Classic spatial puzzles like *Rubik's Cube* require children to be mentally flexible and consider spatial information in devising potential solutions.
- *Cogmed* and *Lumosity* provide computer game puzzles and challenges that are designed to exercise working memory and attention.

Resources

Common Sense Media
- *www.commonsensemedia.org*
- *www.commonsensemedia.org/game-reviews*

List of winning games from American Mensa's Mind Games competitions
- *mindgames.us.mensa.org/about/winning-games/*

Other programs
- *www.cogmed.com*
- *www.lumosity.com*

ACTIVITIES TO
BUILD EXECUTIVE FUNCTION
IN CHILDREN

Washington State Department of
Early Learning

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EXECUTIVE FUNCTION IN CHILDREN

Prepared for Washington State Department of Early Learning by Hollinger Group Training Solutions, LLC.

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Introduction

Scientists and researchers are finding that executive function skills are the biological key to school readiness and a good predictor of school success, better even than IQ. These skills are required for children to be able to get along with others, to compromise, plan, negotiate, pay attention, problem solve and stop themselves from impulsively reacting. Executive functioning captures a set of skills that are increasingly understood as the foundation for successful learning and social relationships. They enable us to work effectively with others, with distractions, and with multiple demands. These are the skills that contribute to the effectiveness of the American workforce.

Most tasks require the successful orchestration of several types of executive function skills. Among scientists who study these functions, three dimensions are frequently highlighted:

- *Working Memory* is the ability to hold and manipulate information in our minds over short periods of time. An example of Working Memory is learning a multistep process like long division.

- *Inhibitory Control* is the ability to filter thoughts and impulses in order to resist temptations and distractions. Classic inhibitory control is shown in this marshmallow test where a child in a laboratory setting is given two choices: take one thing he really wants, the marshmallow, right away or wait for 15 minutes and get two marshmallows.

- *Cognitive or Mental Flexibility* is having the ability to adjust to changes in demands, priorities, or perspectives. It is the capacity to nimbly switch gears and adjust to changes in demands, priorities, or perspectives, to apply different rules in different settings and to catch mistakes and fix them.

In most real-life situations, these three functions don't work in isolation, rather they work together. Being successful often means we need to be able to filter our thoughts and impulses so we can resist temptations, distractions, and habits. Impulse control allows us to pause and think before we act.

A child's experiences during the earliest years of life have a lasting impact on the architecture of the developing brain and their executive function". Developing executive function helps children learn to: pay attention; reason logically; exercise judgment; control their impulses; plan; identify goals and work to achieve them; and assess what is happening and adjust as needed. Play is an important way children build executive function.

How to use this booklet

Children use play to learn and make sense of the world, develop social and cognitive skills and mature emotionally. Adults (teacher or parents) can use these fun activities to help children build their executive function skills. Many of the activities in this booklet are things you already do. The "Objective" for each activity describes the executive function skill the activity supports.

This booklet organizes activities and resources by child's age. Most the activities have "More to Do" suggestions for how to extend the activity for different ages and to continue to challenge the child as they develop. Parents and caregivers can use these activities to introduce and reinforce executive function.

When doing activities with children, you build executive function by:

- Being responsive to your child's interests.
- Encouraging your child to try different ways to do something.
- Playing hide-and-search games with your child.
- Playing games that require following "rules" that you agreed on and can change together, such as when playing make-believe.
- Providing ample time and enough materials for make-believe play with other children.
- Asking your child what he or she is doing and feeling, and why.
- Asking your child: "What else could you do? What do you think would be best?" in a nonjudgmental, interested tone.
- Sharing your own thinking about what you are doing and feeling, and why.
- Problem-solving with your child in daily activities.
- Listening to your child's ideas and thoughts.
- Noticing what allows laughter to bubble up and playing in ways that allow for your child's laughter (avoiding tickling, which can feel overwhelming).

Activities for 3 to 5 year olds

Children's executive function skills grow at a fast pace during this 3 to 5 year old period, so it is very important to adapt these activities to match the skills of each child. Younger children will need a lot of support in sustaining the rules and structures that guide these activities, while older children will be more independent. Ultimately, the goal is to move children towards more independent self- regulation, so try to intervene only as much as is necessary.

During imaginary play children develop rules for characters and plots to guide their actions, hold increasingly complex ideas in mind and shape action to follow these rules, while inhibiting impulses or habits that don't fit the game. While younger children tend to play alone or in parallel, children quickly learn to play cooperatively and often regulate each other's behavior, an important step in developing their own self-regulation.

Children love to tell stories. Early stories tend to be a series of events, each one related to the one before, but without any larger structure. With practice, children develop more complex and organized plots. As the complexity of the story telling grows, children are practicing holding and manipulating information in working memory.

Songs and movement games continue to be popular at this age, but it is important that they become increasingly complex to interest and challenge children as they get older.

Matching and sorting activities are still fun, but now children can be challenged to sort by different rules, such as first sorting objects by color, then resorting them by shape. For a more challenging version, play a matching game, but change the rule for each pair. Or play a lotto game where children have to mark the opposite of what is called (i.e. for "day", put a chip on a picture of night). Children have to inhibit the tendency to mark the picture that matches while remembering the rule.

Imaginary Play

3 – 5 year olds

Objective

During imaginary play children develop rules for characters and plots to guide their actions, hold increasingly complex ideas in mind and shape action to follow these rules, while inhibiting impulses or habits that don't fit the game.

Materials

Healthy Play Foods: cheese, apples, bananas, grapes, broccoli, squash, cucumbers. Shopping bags, play money, purses, cash register, play grocery cart.

What to Do

Set up a grocery store where children have imaginary play. They can pretend to shop for items that help keep teeth healthy. Include signs, food labels, and prices.

More to Do

Use any of the PROPELS ideas found in the Tools of the Mind curriculum..

Storytelling

3 – 5 year olds

Objective

This activity will encourage children to develop more complex and organized plots. As complexity grows, children are practicing holding and manipulating information in working memory.

Materials

Regular materials like construction paper, magazine pictures, white paper, crayons for making book of shared event and familiar props and toys to encourage children's storytelling.

What to Do

Encourage children to tell stories to you and write them down to reread to the child.

Children can make pictures and create their own books. Revisiting the story, either through reviewing pictures or words, supports more organization.

More to Do

Tell group stories. One child starts the story and then each person adds something to it. Children need to pay attention to each other, reflect on possible plot twists and constrain their additions to fit the plot.

Have children act out stories they have written. The story provides the structure that guides children's actions and requires them to attend to the story and follow it, while inhibiting the impulse to create a new plot.

Encourage bilingual families to tell stories in the home language. Benefits of bilingualism for a variety of executive function skills have been found for children of all ages.

Walk the Line

3 – 5 year olds

Objective

This exercise helps the child control their body; develop balance and equilibrium, as well as to strengthen the mind's control of its body's movements.

Materials

Red Line - The line used during this exercise should run the length of the room, be a little wider than the shoe of a child and be a permanent shape in the center.

What to Do

Have the children all stand on the red line, an equal distance from each other.

Tell them that when the music begins, please walk on the line is a normal manner, but keep the same distance from the person in front of them.

Once the music has stopped, they can all have a seat where they were.

Start playing the music and stop it when you feel they are losing their concentration.

Discuss as a group how this was for each of the children. Tell the children that they are free to walk on the line just as you did today whenever they would like.

More to Do

Have the children:

- Vary the speed of the walk. Ask them to walk very slowly.
- Straddle the line with one foot on either side and try not touch the line
- Walk backwards down the line
- Jump down the line
- Walk the line heel of one foot to the toe of the other foot. You may need to demonstrate this one first.
- Hold an object while walking the line

Repetitive Songs

3 – 5 year olds

Objective

Challenge working memory. Songs that repeat and add on to earlier sections (either through words or motions) challenge the working memory.

Materials

Enough space for children to form a circle.

What to Do

Sing the song adding a new animal for each verse.

Lyrics to: Bought me a Cat

Bought me a cat and the cat pleased me,
I fed my cat under yonder tree.
Cat goes fiddle-i-fee.

Bought me a hen and the hen pleased me,
I fed my hen under yonder tree.
Hen goes chimmy-chuck, chimmy-chuck,
Cat goes fiddle-i-fee.

Bought me a dog and the dog pleased me,
I fed my dog under yonder tree.
Dog goes bow-wow, bow-wow,
Horse goes neigh, neigh,
Cow goes moo, moo,
Pig goes oink, oink,
Sheep goes baa, baa,
Goose goes hissy, hissy,
Duck goes quack, quack,
Hen goes chimmy-chuck, chimmy-chuck,
Cat goes fiddle-i-fee.

More to Do

Do the motions to *She'll be Coming Round the Mountain.*

The Alphabet Song

Five Green And Speckled Frogs (countdown to "*Then there were no green and speckled frogs*".)
Five green and speckled frogs sat on a speckled log
Eating some most delicious bugs -- YUM YUM!
One jumped into the pool where it was nice and cool
Then there were four green and speckled frogs.

Movement Songs

3 – 5 year olds

Objective

Movement songs require children to attend to the words, hold the words of the song in working memory and use them to guide their actions.

Materials

Enough space for children to form a circle.

What to Do

Stand in a circle as you sing the song. "IT" walks around the outside of the circle until you hear the lyrics, "Find your lucky zero." Then "IT" stops and stands back-to-back with the nearest child. "IT" moves to the side and front of the child as directed by the lyrics, then "IT" taps the chosen child's shoulder. Then "IT" sits down and the "lucky zero" becomes "IT".

Lyrics to song

Circle 'round the zero.
Find your lucky zero.
Back, back, zero.
Side, side, zero.
Front, front, zero.
Tap your lucky zero. (Repeat until all children are sitting down.)

Matching and Sorting

3 – 5 year olds

Objective

This activity requires children to understand the rule that organizes the activity, hold the rule in working memory and focus on following it.

Materials

Bingo style cards with words. A set of words that are opposite of the words on the Bingo style cards.

What to Do

Play a Bingo style game where children have to mark the opposite of what is called (i.e. for "day", put a chip on a picture of night).

More to Do

Puzzles – children can master increasingly complicated puzzles and exercise their visual working memory and planning skills. They must match each puzzle piece to its intended location.

Imaginary Play

3 – 5 year olds

Objective

Pretend cooking is also a lot of fun for young children. They practice inhibition when waiting for instructions, working memory while holding complicated directions in mind and focused attention when measuring and counting.

Materials

Pictures of food, cooking utensils, kitchen appliances and a picture recipe.

What to Do

Display a picture of food (i.e. a cake with frosting). Have the children choose the pictures of what foods, utensils and appliances they would need to make the object shown in the picture.

Ask the children questions like; what comes first, cracking the eggs, mixing the batter, baking the cake, eating it. What happens if you bake the cake before adding all ingredients?

More to Do

If your environment allows, cook the recipe the class created with the pictures.

Animal Span

3 – 5 year olds

Objective

This activity assists children in developing working memory skills

Materials

Pictures of animals like a cat, horse, frog, and insect.

What to Do

Show the child all the pictures in no particular order. Then have the children place the pictures of the animals in order from the smallest to biggest.

More to Do

Have the children sort by color, or number of legs

Body Parts

3 – 5 year olds

Objective

To work on impulse control.

Materials

Index card, magazines and glue

Cut out body parts from the magazines, glue to index cards. You could use store bought body part cards if you have them.

What to Do

Hold up a card with one body part and call out the name for a different body part. The impulse, of course, is to touch the part seen on the card, rather than listening to what the teacher said to do.

Telephone Game

3 – 5 year olds

Objective

This game allows you to see how well you listen.

Materials

Several silly sentences printed on a piece of paper.

What to Do

Line the class up in a straight line. The teacher should read the sentence into the ear of the first child in line. That child then repeats what she heard into the next person's ear. You can't ask to hear it again. The last person in line says what he/she heard out loud. Read the sentence out loud to the class.

More to Do

Clap and Follow

This game can begin with the class in their chairs, just make sure there is enough room for everyone to stand up and move freely. Give the class the following instructions:

When I
clap 1 time, stand up
clap 2 times, hop in place
clap 3 times, rub your belly

Go through the series of claps several times, mixing up the order.

Plant Care

3 – 5 year olds

Objective

Introduce child to taking care of plants. Many people who garden find it meditative. Similarly for children, plant care is a simple task that requires a present state of mindfulness.

Materials

Plant with leaves that are large enough to hold. The leaves need to be large enough that they can be dusted.
Small cloth or sponge

What to Do

Show the child a plant and the cloth or sponge. With one hand, gently hold the leaf without pulling it or tearing and with the other hand, gently wipe the surface of the leaf. This activity can be extended to include watering the plant as well.

Grace and Courtesy Lesson

3 – 5 year olds

Objective

Reinforce 3 basic types of social skills that can be developed into grace and courtesy lessons: manners/courtesy, classroom procedures, conflicts

What to Do

Identify the behavior/situation you want to address
Through observation, experience and anticipation.

Identify what it is that you want the children to do
This requires thoughtful preparation

Enlist the help of other adults/capable children to help if needed
Classroom assistant
Experienced children

Gather a small group of children

"I'm going to show you what to do/say when----"

Act it out

Give each child the opportunity to practice the role play

"Now you know what to do when ----"

Considerations:

- All adults must consistently model the behavior/action.
- In order to be effective, adults must have trusting relationships with the children
- Repeat the role plays until you see it happening spontaneously in the classroom.
- Some situations will need supports or prompts.
- Do not single out the "target child"
- Do not explain, or give a reason- this is not appropriate for children under 6.
- Keep each role play short and fun!

Sensory Play – Sounds

3 – 5 year olds

Objective

Help children develop self-regulation.

Materials

Sensory play objects (three different materials that make different sounds)

Music that changes in rhythm and may repeat

What to Do

In this activity, children are given music cues for cognitive shifting and must inhibit the response with one movement to move on to the next.

Use the materials to "play" along with the song. Change the prop and associated noise or movement with each change in rhythm. For example, slither streamers, sweep the scarves and snap a piece of plastic to the music.

More to Do

Tell a story out loud to music. Look for a piece of music that changes in relation to the feeling and mood of the story. The adult can act out the story through body movements and then have the children try the next time.

Sensory Play - Music

3 – 5 year olds

Objective

Activities to develop EF function through rhythm and music sensory play. Help children develop self-regulation.

Lyrics to song

Sung to the tune of Brother John:
Have children line up facing a wall and demonstrate an activity walking backwards with coordinated movements through a chant.
"Now I'm marching, now I'm marching, back, back, back...back, back, back. Running, Running, Running.... Running, Running, Running, now we stop, now we stop!"
Or
"Now I'm tipping, now I'm tipping, side to side, side to side, running, running, running... running, running, running, now we stop, now we stop!"

Sensory Play – Hearing

3 – 5 year olds

Objective

Help children develop self-regulation and mental memory.

Materials

Story Book
Regular materials for creating pictures.

What to Do

Tell your class you are going to tell them a story. Emphasize they will need to listen very careful.

Ask the class to act out the story. Select a child to be the painter and rest of the children to be mice. Read the story as they act out what you are reading.

Read the story again in about a week, then ask the children to act it out again. Continue this process with less and less scaffolding.

More to Do

This activity can be extended by creating a book to capture the story that can be revisited. The experience must be held in working memory while the child considers the order in which things happened and why things happened the way they did.

Red Light-Green Light

3-5 year olds

Objective

Help children develop self-regulation and mental flexibility.

What to Do

Have children stand in a line. When you say green light children can move or run forward. When you say red light the children must stop and stand still,

More to Do

For older children, choose a picture of a shape or person in various positions. When you pause or stop the song have the children freeze in the position shown in the picture you chose.

"Mother May I" or "Simons Says"

3-5 year olds

Objective

Help children develop self-regulation and mental flexibility.

What to Do

Have children line up across from you. Tell the children they should obey you when you first say the words "Simon says." (or Mother May I). Tell them that they are out of the game if they follow an order that doesn't begin with "Simon says," or if they fail to do what Simon says to do.

Begin by saying something like, "Simon says, put your hands on your head." Look to make sure everybody has put their hands on their heads. Give another order such as, "Simon says, stand on one foot." Check again. Continue giving orders.

Mix it up and say something without the preface "Simon says" like, "Raise your right hand," Call out the players who raise their hands. Play until one person is left. This is the winner

More to Do

Let that child that won give the commands for the next round.

Cut the orders short, saying, "Simon says, do this," and make the motion you want mimicked, such as putting your hands on your shoulders. Do this step several times with a different command each time. Then say "Do this," and make the motion -- put your hands on your waist, for example. Many players will automatically follow your lead (and end up out of the game).

Relax and say something like "Straighten up the line," in a casual manner. Again, several players may comply (and they'll be out).

Single out specific players, especially older ones who are harder to fool. Say, "Chris, move back (or up) a step." She might fall for it. Or ask a question every now and then. Point and ask, "What's your name again?" If the person answers, he's out.

Keep the pace moving fast. Everyone will be laughing so hard, they won't care who's in or out, or who wins or loses.

Activities for 5-7 year olds

This handout provides a list of games that challenge children's executive function skills—and allow them to practice the skills—in different ways. At this age, children are starting to enjoy games that have rules, but with widely varying interest and skill. Since the key to developing executive function skills is constant challenge, it's important to choose games that are challenging but not too hard for each child. As children become familiar with these games, the challenge is greater if they remember and enforce the rules independently; try to step back as soon as possible. Just be prepared with some techniques for negotiating conflict such as flipping a coin or drawing a straw.

Card/Board Games

- Games that require memory of the location particular cards are great at challenging working memory. At the simplest level, there are games like *Concentration* where children uncover cards and then have to remember where matches are. At a more complicated level are games that require tracking cards as well as remembering locations, like *Go Fish, Old Maid, Happy Families,* and *I Doubt It.*
- Games in which the child can match either by suit or number are also good at practicing cognitive flexibility – games like *Crazy Eights, Uno, Spoons* etc. *Blink* and *Set* are new card games in which cards can be matched on more than two dimensions.
- Games that require monitoring and fast responses are also great for challenging attention and inhibition. *Snap* and *Slapjack* are card games that fall into this category. *Perfection* draws on similar skills.
- Any board game that involves some strategy provides important opportunities to make and hold a plan for several moves ahead in mind, considering the varying rules that govern different pieces, and adjusting strategy in response to your opponents' moves. Through strategizing, working memory, inhibitory control and flexibility have to work together to support planful and effective play. *Mancala, Checkers, Chinese Checkers, Sorry, Battleship* and *Parchesi* are some of the many examples of these types of games for children this age.

Physical Activities/games

- Games that require attending and responding quickly practice attention and inhibition such as *Red Light, Green Light, Freeze Dance (Musical Statues), Musical Chairs,* even *Duck, Duck, Goose* for younger children. Some of these games also require the person who is "It" to mentally track others' movements, challenging working memory as well, like *Mother May I, What Time is it Mr. Fox.* Others require selective responding and challenge inhibition, such as in the *Magic Word Game,* in which children wait for a "magic word" to start an action.
- Fast moving ball games require constant monitoring, rule following, quick decision making and self-control, such as *Four Square, Dodgeball* and *Tetherball.*
- *Simon Says* is another great game for attention, inhibition and cognitive flexibility as the child has to track which rule to apply and switch as appropriate. Other versions are the Australian *Do This, Do That* or the variation, *Do What I Say, Not What I Do.*
- Children are now old enough to begin to enjoy structured physical activities, like organized sports. Games that require coordination and provide aerobic exercise, such as soccer, have been shown to support better attention skills. Physical activities that combine mindfulness and movement, like *yoga* and *tae kwon do*, also help children develop their ability to focus attention and control actions.

Movement/ Song Games

- Copy games, when the person imitating has to hold in working memory the model's actions, challenge working memory. *Punchinella* is one example, with the model watching during the second verse ("I can do it too"). Call and response songs provide a similar auditory challenge, like *Boom Chicka Boom* and *I Met a Bear.*
- Songs that repeat and add on to earlier sections (either through words or motions) also exercise working memory, like the motions to *She'll Be Coming Round the Mountain,* the words to *Bought Me a Cat.* The classic memory game of *Packing a Picnic* or *Packing a Suitcase for Grandma's* fall in this category too. Older children can enjoy the added challenge of alphabetizing the list.
- Singing in rounds is also a great challenge for older children requiring use of working memory and inhibition. *Row, Row, Row Your Boat* is a simple round to start with, but there are many with increasing complexity.
- Complicated clapping rhythms also practice working memory, inhibition and cognitive flexibility, and have been popular with generations of children in many cultures. *Miss Mary Mack* and *Down Down Baby* are familiar examples.

Quiet Activities requiring strategy and reflection

- Children become increasingly independent at this age and puzzle/ brain teaser books that include mazes, simple word finds, matching games, etc. provide challenges to attention and problem solving (requiring working memory and cognitive flexibility).
- Logic and reasoning games, in which rules about what is possible need to be applied to solve puzzles, start to become interesting as well and provide great working memory and cognitive flexibility challenges. Thinkfun provides some appealing and age appropriate versions with *Traffic Jam* and *Chocolate Fix*, while *Mastermind* is another old favorite that now has a simpler version for younger children. Educational online game sites provide many similar activities as well.
- Guessing games are also popular and require working memory and flexible thinking to hold in mind previous responses and develop and discard potential theories. *20 Questions* or *Guess My Rule* (often played with attribute blocks where children try to guess which attribute, or set of attributes, is the rule) are popular examples.
- *I Spy* and the books derived from this game require children to attend to categorization and use selective attention in searching for the correct type of object.

Activities for 7-12 year olds

Activities for this age group should challenge the children's executive function skills—and allow them to practice the skills—in different ways. During this age range, steadily increasing the challenge of games and activities that children enjoy is important.

Card/ Board Games

- Card games in which children have to track cards provide a good challenge in using working memory and flexible thinking for planning and strategy. Games like *Hearts, Spades,* and *Bridge* are popular examples.
- Games that require monitoring and fast responses continue to be great for challenging attention and quick decision making. *Spit* is an example that requires attending to your own play and your opponents' progress.
- Card games requiring matching by either suit or number continue to challenge cognitive flexibility for younger children. *Gin* and *Rummy* are popular examples. Games with more complicated sets of options, such as *Poker* and *Mah Jong* may challenge older children.
- Time spent developing skill at any game involving strategy provides important practice holding complicated moves in mind, planning many moves ahead and then adjusting plans, both in response to imagined outcomes and opponent's play. With practice, children can develop real skill at classic games of strategy like *Chess* or *Go,* while challenging working memory and cognitive flexibility. Many more modern strategy games exist as well. Mensa provides an interesting list of new favorites.
- Children also enjoy more complex fantasy play games which require holding in working memory complicated information about places visited in imaginary worlds, rules about how characters and materials can be used and strategy in attaining self-determined goals. *Minecraft* is a popular computer game of this sort while *Dungeons and Dragons* is a long-time favorite. For older children, computer games like *Myst,* provide a similar challenge.

Physical Activities/ games

- Organized sports become very popular for many children during this period. Developing skill at these games practices children's ability to hold complicated rules and strategies in mind, monitor their own and others' actions, make quick decisions and respond flexibly to play. There is also evidence that high levels of physical activity, particular activity that requires coordination, like soccer, can improve all aspects of executive functions.
- Various jump rope games also become very popular during this period. Children can become very skilled at jump rope, double dutch, Chinese jump rope and other such challenges. Focused practice is necessary to develop the skills needed for these games, as well as the attention control and working memory to remember the words of the chant while simultaneously attending to the motions.
- Games that require constant monitoring of the environment and fast reaction times also challenge selective attention, monitoring and inhibition. For younger children, hiding/ tag games particularly those played in the dark, like *Flashlight Tag* and *Ghost in the Graveyard* are fun. Older children may enjoy games like *Laser Tag* and *Paintball.* Many video games also provide practice of these skills, but can include violent content, so care should be taken in selecting appropriate options. Common Sense Media provides useful reviews of popular games.

Music and Dance

- Learning to play a musical instrument can challenge selective attention and self-monitoring, as children learn the physical skill required, as well as working memory to hold the music in mind. There is also some evidence that the practice of bimanual coordination involved supports better executive function.
- Singing in parts and rounds, as is done in children's singing groups, is also a great challenge requiring a similar coordination of working memory, monitoring and selective attention. As children's musical skill grows they can be presented with steadily increasing challenges.
- Participation in dance and music requiring the learning of complicated rhythmic patterns, particularly when improvisation is involved, can also provide such incremental challenges to coordination of working memory, attention, cognitive flexibility and inhibition. Rhythm games like *Pattin' Juba* are fun, as well as practice in drumming, tap dancing and jazz music.

Brain Teasers

Puzzles that require information to be held and manipulated in working memory can be great challenges.

- Crossword puzzles are available for all skill levels and draw on manipulation of letters and words in working memory as well as cognitive flexibility.
- Sudoku puzzles provide a similar challenge but working with numbers and equations rather than letters and words.
- Classic spatial puzzles like the Rubik's Cube, require children to mentally rotate and consider spatial information to problem solve potential solutions.
- CogMed has developed a series of computer-based puzzle games for children that have been shown to develop working memory.
- *Fit Brains, Lumosity* and *Minds360* all provide computer-game format puzzles and challenges that are designed to exercise particular aspects of executive functions

Add Your Own Activities

Objective	*What to Do* *More to Do*

Objective	*What to Do* *More to Do*