THE SESSION COLLECTIVE

# Developing Executive Function

*The Play Phase and its role in developing young children's executive functions.*

We prepare dinner while simultaneously helping our children with their homework and make notes about appointments we need to schedule for the week. We focus on our jobs when we need to and our families when they need us. We take a deep breath, rather than honk, if the car in front of us fails to move immediately when the light turns green. (Sometimes).

As adults, our capacities to multitask, to display self-control, to follow multiple-step directions even when interrupted, and to stay focused on what we are doing despite ever-present distractions are what undergird the deliberate, intentional, goal-directed behaviour that is required for daily life and success at work. And while there are cognitive limits to anyone's ability to multi-task effectively, we need and rely on these basic skills in all areas of our lives. Without them, we could not solve complicated problems and make decisions, persist at tedious but important tasks, make plans and adjust them when necessary, recognise and correct mistakes, control our impulsive behaviour, or set goals and monitor our progress toward meeting them.

Children need to develop these skills, too, in order to meet the many challenges they will face on the road to becoming productive, contributing members of their communities. As essential as they are, we aren't born with the skills that enable us to control impulses, make plans, and stay focused. We are born with the potential to develop these capacities —or not—depending on our experiences during in- fancy, throughout childhood, and into adolescence. Providing the support that children need to build these skills at home, in child care and preschool programs, and in other settings they experience regularly is one of society's most important responsibilities. Being able to focus, hold, and work with information in mind, filter distractions, and switch gears is like having an air traffic control system at a busy airport to manage the arrivals and departures of dozens of planes on multiple runways. In the brain, this air traffic control mechanism is called executive function.

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Our **Play Phase** philosophy provides opportunities to develop these important life skills. In partnership, the adults and children will work together to explore and experiment with lots of different objects and movements. The children will also be encouraged to cooperate, to discuss and to provide ideas and suggestions.

## So what are executive functions?

Completing most tasks requires the successful orchestration of several types of executive function skills. Among scientists who study these functions, three dimensions are frequently highlighted: ***Working Memory, Inhibitory Control, and Cognitive or Mental Flexibility***. In most real-life situations, these three functions are not entirely distinct, but, rather, they work together to produce competent executive functioning.

**WORKING MEMORY** is the capacity to hold and manipulate information in our heads over short periods of time. It provides a mental surface on which we can place important information so that it is ready to use in the course of our everyday lives. It enables children to remember and connect information from one paragraph to the next, to perform an arithmetic problem with several steps, to keep track of the moves and make a logical next step in a game of chess, and to follow multiple-step instructions without reminders. It also helps children with social interactions, such as planning and taking turns in group activities, or easily rejoining a game after stepping away to get a drink of water.

**INHIBITORY CONTROL** is the skill we use to master and filter our thoughts and impulses so we can resist temptations, distractions, and habits and to pause and think before we act. It makes possible selective, focused, and sustained attention, prioritisation, and action. This capacity keeps us from acting as completely impulsive creatures who do whatever comes into our minds. It is the skill we rely on to help us “bite our tongue” and say something nice, and to control our emotions at the same time, even when we are angry, rushed, or frustrated. Children rely on this skill to wait until they are called on when they know the answer, to be good at games like “Simon Says” and “Red Light/ Green Light,” to stop themselves from yelling at or hitting a child who has inadvertently bumped into them, and to ignore distractions and stay on task in school.

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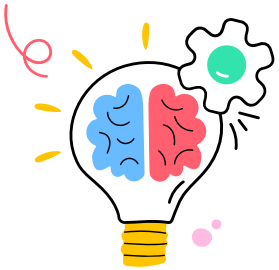
**COGNITIVE OR MENTAL FLEXIBILITY** is the capacity to nimbly switch gears and adjust to changed demands, priorities, or perspectives. It is what enables us to apply different rules in different settings. We might say one thing to a co-worker privately, but something quite different in the public context of a staff meeting. Likewise, we teach our children about “outside voices” and “inside voices” and the different situations in which they should use each. Cognitive flexibility enables us to catch mistakes and fix them, to revise ways of doing things in light of new information, to consider something from a fresh perspective, and to “think outside the box. Children deploy this skill to learn exceptions to rules of grammar, to approach a science experiment in different ways until they get it to work, or to try different strategies when they are working out a conflict with another child.

***Executive function skills are crucial building blocks for the early development of both cognitive and social capacities.***

The process of development is sometimes portrayed as one in which children gradually manage more and more aspects of their environments and lives on their own. We would not trust two-year-olds to stop going after a ball just because it rolled into the street, get ready in the morning (brush their teeth, pick out their clothes, and get dressed) by themselves, or even clean up their toys without reminders. Adults set up the framework (i.e., establishing routines, providing cues, breaking big tasks into smaller chunks) that helps children use the executive function skills they are developing to the best of their abilities. We call these techniques “scaffolding.” Just as a scaffold supports workers while a building is being erected, adults can use these activities to support the emergence of children’s executive function skills until they can practice and perform them on their own.



Our Play Phase philosophy gives the children a voice and an important role to play in how the activities progress. They are encouraged to give ideas and feedback and over time are given a greater say in what their development looks like. This can be quite threatening at first for our “Play Captains” but working in this way is an important part of our approach to teaching, learning and development.

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Executive function skills are considered to be a common denominator for both learning and social interaction. Young children who have problems staying focused and resisting urges to respond impulsively—two core executive function skills—not only have trouble in school but also have trouble following directions generally and are at elevated risk of displaying aggressive and confrontational behaviour with adults and other children.

Children's social play is believed to be an important practice ground for the development of executive function skills. Partly, this is because children need to test for themselves the skills that adults have been scaffolding for them. For example, they have to come up with the plan for playing house, communicate with each other about role assignments and then remember that Susie will be the bossy older sister, Ralph will play the dog, and Jackie will be the baby. In this scenario, keeping track of what each actor has done and inserting a new piece of the story that makes sense to everyone requires the effective exercise of emerging executive function skills.

A young child's environment of relationships plays an important role in the development of executive capacities. Environments that foster executive functioning are characterised by adult-child relationships (both within and out- side the home) that guide children from complete dependence on adult support to gradual assumption of the "executive" role for them- selves. Such environments neither expect children to have more advanced skills than are reasonable for their age, nor do they treat them as if they had no executive capabilities. Growth-promoting environments provide substantial "scaffolding" to help young children practice emerging skills before they are expected to perform them on their own.

In our Play Phase 2v2 games, children are able to learn how to collaborate in pairs and other small groups. This format of the game will also build a sense of togetherness and achievement when playing with and against others. Sharing and communicating in this way under the watchful eye of a "Play Captain" will help lay very strong foundations for each child's social and emotional development.

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# In Summary

## Working Memory

**ADULT:** Can remember multiple tasks, rules, and strategies that may vary by situation
**5-16 YEARS**: Develops ability to search varying locations, remember where something was found, then explore other locations (e.g., a game of Concentration or hiding a penny under one of three cups)
**4-5 YEARS**: Comprehends that appearance does not always equal reality (e.g., when given a sponge that looks like a rock)
**3 YEARS**: Can hold in mind two rules (e.g., red goes here, blue goes there) and act on the basis of the rules
**9-10 MONTHS**: Can execute simple means-to-ends tasks and two-step plans; also able to integrate looking one place and acting (e.g., reaching) at another place
**7-9 MONTHS**: Develops ability to remember that unseen objects are still there (toy hidden under a cloth); learns to put two actions together in a sequence (remove cloth, grasp toy).

## Inhibitory Control

**ADULT:** Consistent self-control; situationally appropriate responses (e.g., resists saying something socially inappropriate, resists “tit for tat” response)
**10-18 YEARS:** Continues to develop self-control, such as flexibly switching between a central focus (such as riding a bike or driving) and peripheral stimuli that may or may not need attention (road signs and pedestrians vs. billboards and passing houses)
**7 YEARS:** Children perform at adult levels on learning
to ignore irrelevant, peripheral stimuli (such as a dot on the side of a screen) and focus on the central stimulus (such as a picture in the middle of the screen)
**4-5 YEARS:** Reductions in perseveration (persisting
with following a rule even when knowing that the rule has changed). Can delay eating a treat; also can begin to hold an arbitrary rule in mind and follow it to produce a response that differs from their natural instinct (sort coloured cards by shape rather than colour)
**9-11 MONTHS:** Able to inhibit reaching straight for a visible but inaccessible reward, such as a toy on the other side of a window, and instead delay a moment to recognise the barrier and detour around it
**8-10 MONTHS:** Begins to maintain focus despite distractions during brief delays in a task
**6 MONTHS:** Rudimentary response inhibition (able to not touch something instructed not to touch).

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**Cognitive Flexibility**

**ADULT**: Able to revise actions and plans in response to changing circumstances
**13-18 YEARS:** Continued improvement in accuracy when switching focus and adapting to changing rules
**10-12 YEARS:** Successfully adapts to changing rules, even along multiple dimensions (okay to shout on playground, not okay in school, okay sometimes in theater rehearsal)
**2-5 YEARS:** Succeeds at shifting actions according to changing rules (e.g., takes shoes off at home, leaves on at school, puts on boots for rain)
**9-11 MONTHS:** Develops ability to seek alternate methods to retrieve objects beyond directly reaching for what's in view.

Sources: Best & Miller (2010)100;
Diamond (1991a, 1991b, 2002, 2006).101,102,8,103
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