

Executive Function: Ages and Stages

	Cognitive Flexibility	Working Memory	Inhibitory Control
Infants (0 - 12 months)	<p>Younger infants have difficulty adjusting their attention or behaviors when patterns start to change. For example, if they see you hide an object in the same location many times, they will continue to search for it there even after they see you hide it somewhere new. But older infants can make the switch when the location changes.</p> <p>Infants can flexibly shift their attention towards new situations and away from things that they find unpleasant.</p>	<p>Infants can hold small amounts of information in their working memory for brief moments, and they are surprised when an object is not where they expect it to be.</p> <p>Partway through the first year, infants start to direct their attention in anticipation that something is about to appear or move in an interesting way, based on their memory of having seen it happen before.</p>	<p>Although infants develop some self-soothing behaviors, caregivers are infants' main regulators, and infants often signal (through crying, for example) that they need regulation from an adult. Some infants are just naturally more reactive to changes in their environment and may need more help in managing emotions.</p> <p>Things that are new (novel toy or face) are "sticky" for infants and attract their attention, especially at younger ages. Their default is to keep paying attention to that new thing, but during infancy, the ability develops to shift their attention away, as needed.</p>
Toddlers (12 - 24 months)	<p>Young toddlers are becoming more flexible with categorizing objects and begin to understand that something like a plush ball can be in a ball category and also a soft toy category.</p> <p>By the end of this period, toddlers can switch from</p>	<p>Toddlers can successfully find a toy they have seen hidden even after a 10 second delay.</p> <p>Toddlers have trouble remembering and enacting a complex series of steps themselves, but they notice when adults are</p>	<p>Like infants, toddlers engage in basic self-regulation strategies, such as thumb sucking, but they may do so more efficiently.</p> <p>When adults give directions and support, toddlers are increasingly able to inhibit their impulsive behaviors to</p>

sorting one type of shape or object to another type.

following complex action patterns and then break them.

follow the instructions instead.

Toddlers are better than infants at maintaining attention to something even in the face of distraction.

Early Preschoolers (2 - 3 years)

Young preschoolers start to be able to sort objects even according to rules that conflict with what the children know about the real world.

By children's 3rd birthday they often show different levels of EF skills in emotional (hot) and non-emotional (cool) situations

Two-year-olds can begin to play games in which they have to keep multiple rules in mind.

By the end of the 2nd year, many early preschoolers can hold and work with 3 pieces of information in their minds.

Even in situations that are emotional (requiring "hot" EF), many two-year-olds can wait up to 3 minutes before opening a gift.

Preschoolers can play games that require inhibitory control, such as waiting for it to be their turn.

Preschoolers (3 - 4 years)

Preschoolers have difficulty adapting their attention or behaviors when asked to do the opposite of what someone has said.

Because preschoolers are better able to hold information in mind, their ability to engage in more complex play increases.

Three-year-olds often vocalize their thoughts as reminders of what rules to follow or things to remember (self-talk).

Although they still rely on adults for regulating behavior, older preschoolers begin to rely on themselves more to regulate compared to younger children.

Preschoolers are growing even better at inhibiting their actions in emotional situations (which require "hot" EF).

Kindergartners (4 - 5 years)

Four-year-olds have an increased ability to think both about their *own* beliefs and the conflicting beliefs of *others* (this is called theory of mind).

Children's working memory capacity continues to increase, and they can hold and work with up to 4 pieces of information in their minds.

Kindergartners often show greater insights into other people's self-regulation/inhibition (or lack of it) compared to younger children.

Unlike preschoolers who primarily use self-talk to regulate, older children take this speech inward and do not need to give themselves reminders out loud as often to regulate.

**School-Agers
(5 - 12 years)**

School-agers can switch back and forth flexibly between multiple rules during sorting games.

Older school-agers can begin to plan how they will complete a complex sequence of actions.

By the end of this period, working memory capacity is around 5 pieces of information, which is similar to working memory in adults.

As children get older they begin to inhibit behaviors proactively rather than just responding to a situation.

Older school-agers become much better at inhibiting automatic responses when there are many conflicting rules.

When school-aged children make an error after failing to inhibit an automatic response they can reflect on the error.