# EVIDENCE SNAPSHOT

## Building the skills of early childhood educators to develop children's executive function

## HIGHLIGHTS

- Protecting and promoting young children's executive function (EF) is crucial for all future learning and development.
- Brain plasticity is greatest in the first few years of life, providing a key window of opportunity, but also vulnerability, for EF development.
- Early childhood adversity and poverty are among the greatest threats to EF development.
- Parents/educators must engage infants and young children in "serve and return" interactions, and age-appropriate scaffolding activities, to promote optimal EF development.

## What is executive function?

Executive function (EF) refers to a group of skills that emerge in infancy and early childhood, and provide the foundation for future learning and cognitive development [1,2]. Three core components are frequently identified:

- ***Working memory*** refers to children's ability to hold and manipulate information in their minds for short periods of time. This forms the basis of children's developing ability to remember and follow instructions, solve problems, and interact with others [1,3,4].
- ***Inhibitory control*** (also known as response inhibition) allows children to manage their thoughts and actions, prioritise, and direct, focus and sustain their attention [1,2,4].
- ***Cognitive flexibility*** (also known as attention shifting) means that children can adjust their goals, switch between tasks, change their priorities, learn from mistakes, and revise their beliefs and actions [1,4].

These fundamental EF skills develop before the age of 3 years, improve rapidly between 3 and 5 years, and become increasingly sophisticated during later childhood and adolescence [4–7].

Together, they allow individuals to self-regulate, which is crucial for optimal adult functioning [4,5]. Research indicates that measures of working memory, inhibitory control and cognitive flexibility predict children's later literacy and numeracy skills, school achievement, interpersonal behaviour, communication skills, and emotion regulation [1,6,8]. Early deficits thus provide shaky foundations for subsequent skill development, resulting in difficulties following directions, completing tasks, sustaining attention and engaging in cooperative play, and an increased likelihood of antisocial behaviour and risk-taking [1–3,9]. These delays create social and learning disparities between children that widen over time and lead to poor social and economic outcomes [6].

## Executive function and brain development

Neuroscientific research indicates that early brain development both contributes to and is shaped by the emergence and refinement of EF. Brain plasticity is at its greatest in the first few years of life, with the overproduction of neural synapses promoting an enormous number of neural connections and enabling rapid cognitive growth and learning [3,10]. In particular, the growth of the prefrontal cortex is associated with the emergence of EF skills [1], laying the foundation for future learning and cognitive development [5]. Children's experiences and activities shape the way the brain continues to develop, as neural connections are either reinforced or pruned according to whether they are used or neglected [5,8].

Early childhood is thus a sensitive period of cognitive development; a window of opportunity with great potential for EF development to be enhanced or disrupted [9,11]. While positive experiences and interactions support the development of EF and associated neural growth, the experience of significant adversity during early life reduces children's ability to practice EF skills. This prevents the brain from optimising the neural connections that are the foundation of future social and cognitive functioning [8,12].

## The impact of adversity

The emergence and refinement of EF skills requires the presence of responsive relationships with caregivers and access to safe, protective environments [4,13]. Physiological and functional development is compromised by exposure to significant or prolonged stress (e.g. poverty, neglect, violence), without the buffering support of responsive caregivers [5,13]. This "toxic stress" results in a continual activation of physiological stress responses designed to ensure survival, preventing the prefrontal cortex from engaging EF skills and impacting the ability to reflect, plan and problem-solve [12,14]. Thus, chaotic, unpredictable or adverse family conditions are associated with suboptimal brain development during early childhood, leading to persistent problems with EF-related learning and skills [2,14].

### Key cognitive challenges associated with the experience of prolonged adversity include [14]:

- Difficulty maintaining attention, achieving goals, managing time, making decisions and applying learned information.
- Difficulty managing behaviour and emotions, delaying gratification, and working with others.
- Difficulty engaging in healthy behaviours, recovering from illness and coping with mental illness.

Poverty is a key contributor to toxic stress in early childhood, and is associated with poorer working memory, inhibitory control and cognitive flexibility [1,4]. Low income families experience a multitude of challenges, including difficulty accessing quality housing, healthcare, childcare and education [4,14]. They are more likely to experience food insecurity, mental health problems, unemployment and prejudice, and less likely to achieve goals due to resource constraints [4,14]. These forms of adversity make it harder for parents/carers to ensure low-stress environments and to engage in the interactions and activities that support their children's EF development [4,12,14]. In particular, they may have less time or capacity for crucial "serve and return" activities, in which adults respond to and encourage infants' efforts to interact through language, gestures and emotional expression [5,14].

These effects of stress and adversity on brain development and EF skills contribute to the lower levels of school-readiness and social and cognitive competencies among children from low-income families [6,14]. In this way poverty contributes to a cascade of negative outcomes that results in further hardship and vulnerability, including poor educational outcomes, social and emotional difficulties, criminal activity and unemployment [14]. Children who grow up in adverse environments are doubly vulnerable, as the EF skills that are underdeveloped are also those needed to achieve greater social and economic stability [14]. In addition to the impact of adversity, a number of other factors can create individual differences in children's EF, such as genetic makeup, temperament and developmental delays [1].

## What can early childhood educators do?

Responsive caregivers provide interactions and activities that act as scaffolding for young children by allowing them to practice EF skills in supportive environments [1,2,8]. Table 1 provides examples of appropriate activities for various stages of early childhood, as recommended by the Center on the Developing Child [15]. These can be made more challenging as the child's capabilities improve, and the gradual reduction of adult assistance helps children learn to practise them more independently [1].

may require extra support including mentoring, engaging and simple information, structured organisational tools, and opportunities to practise and receive constructive feedback [14]. Specific training programs are available for children who face difficulties with multiple aspects of executive functioning, including focussed preschool interventions, which may be supplemented with the expertise of a mental health professional [1]. Importantly, these interventions do not need to be implemented separately, but rather can be blended with those programs targeting early literacy and math instruction, or incorporated into parent-focused interventions [1].

| Age | Activities | Skills practised |
|---|---|---|
| 6-18 months | Lap games (peek-a-boo; pat-a-cake); Hiding games (find the toy, hide and seek); Imitation or copying games (gestures, toys); Simple role playing (involving child in daily tasks); Fingerplays (eensy-weensy-spider); Conversation (naming objects, talking about events). | Working memory, attention, self-control, tension regulation, language, imaginative play. |
| 18-36 months | Active games (song games with gestures, physical activities, imitation games, 'freeze' games); Conversation and storytelling (narrating play, reflecting on experiences, talking about feelings); Matching/sorting games (sort objects by characteristics, simple puzzles); Imaginary play (pretending to clean or cook; child-directed games; provision of props). | Focus and sustain attention, action inhibition, working memory, trying new strategies, imaginary play. |
| 3-5 years | Imaginary play (provision of inspiration and props; group play); Story telling (creating stories through words, images and acting; group collaboration); movement songs and games (physical games; 'freeze' games; yoga); quiet games and activities (matching and sorting, puzzles, cooking). | More independent use of EF-related skills: Working memory, attention, inhibition, cooperative play, social problem solving, language, cognitive flexibility. |

**Table 1:** Early childhood age-appropriate activities to enhance EF skills

It may also be necessary to work with parents, through coaching and training, to enhance their capacity to foster such skills in their children [5]. This is particularly important for communities, groups and families experiencing poverty [11]. Practitioners who engage with parents in these circumstances should be aware that parents' own capacity for attention, memory and planning may have been undermined by childhood adversity, and they

Fully integrated, two-generation programs that address the needs of both children and their caregivers to develop sound executive functioning, particularly in cases of families experiencing adversity, is strongly recommended to drive breakthrough impacts in early childhood development well into the future [16].

## IMPLICATIONS FOR POLICY AND PRACTICE

- Early care and education programs need resources and training to enhance their capacity to promote EF skill development [17].
- Health and education services should engage with parents to enhance their awareness of the importance of EF development, and how to protect and promote it.
- Community, state and national policies and services must proactively protect young children from toxic stress, including poverty, violence and maltreatment [13].
- Parents experiencing adversity may need early support to enhance their own wellbeing and EF skills, such that they can protect their children from toxic stress and promote optimal EF development.

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