ADHD and Executive Functioning

Bettina Hohnen (Phd, DClin Psy)

Victoria Bagnall (MA, PGCE)
<table>
<thead>
<tr>
<th>Bettina Hohnen</th>
<th>Executive Functioning skills: what are they?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Executive Functioning in ADHD</td>
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<td>Brain development and the frontal lobes</td>
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<td>Victoria Bagnall</td>
<td>What Executive Functioning skills are needed to be academically successful?</td>
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<td>Bettina Hohnen</td>
<td>Evidence base for training Executive Functioning skills</td>
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<td>Victoria Bagnall</td>
<td>What Connections in Mind Offers</td>
</tr>
</tbody>
</table>
Executive functions

A collection of processes that are responsible for guiding behaviour including planning, selecting appropriate goals, habitual responses, self-control
Building the Brain’s air traffic control system

https://www.youtube.com/watch?v=efCq_vHUMqs
### Executive Functions

<table>
<thead>
<tr>
<th>Executive Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response inhibition</strong></td>
<td>The capacity to think before you act; this ability to resist the urge to say or do something allows your child the time to evaluate a situation and how his or her behavior might impact it</td>
</tr>
<tr>
<td><strong>Working memory</strong></td>
<td>The ability to hold information in memory while performing complex tasks. It incorporates the ability to draw on past learning or experience to apply to the situation at hand or to project into the future</td>
</tr>
<tr>
<td><strong>Emotional control</strong></td>
<td>The ability to manage emotions to achieve goals, complete tasks, or control and direct behaviour</td>
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## Executive Functions

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Sustained attention</strong></td>
<td>The capacity to keep paying attention to a situation or task in spite of distractibility, fatigue, or boredom.</td>
</tr>
<tr>
<td><strong>Task initiation</strong></td>
<td>The ability to begin projects without undue procrastination, in an efficient or timely fashion.</td>
</tr>
<tr>
<td><strong>Planning/prioritization</strong></td>
<td>The ability to create a roadmap to reach a goal or to complete a task. It also involves being able to make decisions about what's important to focus on and what's not important</td>
</tr>
</tbody>
</table>
# Executive Functions

<table>
<thead>
<tr>
<th>Organisation</th>
<th>The ability to creating maintain systems to keep track of information or materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time management</td>
<td>The capacity to estimate how much time one has, how to allocate it, and how to stay within time limits and deadlines. It also involves a sense that time is important.</td>
</tr>
<tr>
<td>Goal-directed persistence</td>
<td>The capacity to have a goal, follow through to the completion of the goal, and not be put off by or distracted by competing interests.</td>
</tr>
</tbody>
</table>
Executive Functions

<table>
<thead>
<tr>
<th>Flexibility</th>
<th>The ability to revise plans in the face of obstacles, setbacks, new information, or mistakes. It relates to an adaptability to changing conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metacognition</td>
<td>The ability to stand back and take a bird’s eye view of yourself in a situation, to observe how you problem-solve. Includes self-monitoring and self-evaluation</td>
</tr>
</tbody>
</table>
Executive functions (EFs)

- Children with EF difficulties (and indeed adults) often have excellent memory and capacity to master academic skills but they struggle with the how of using these skills. They struggle with the processes of life.

- They are often inconsistent, unpredictable, poorly organised, inefficient in their ability to make plans, poor at keeping track of time, poor at regulating their behaviour.

- These are the kids that are very bright but are always getting into trouble, forgetting things, losing things and they are often seen as lazy.

- Can be confusing to adults as EFs seem like lower order skills - why can’t they do it?
Neuroscience technology
Brain development

Brain plasticity
Slices of the brain: cell connection and pruning
Child’s maturing brain

- [Link](http://www.nytimes.com/interactive/2008/09/15/health/20080915-brain-development.html?_r=0)

- Process of maturation happens on average earlier for girls (perhaps 2 years earlier)
Developmental trajectory of ADHD

- Early skills: working memory, cognitive flexibility, response inhibition
- Middle childhood: emotional control, sustained attention, flexibility
- Later childhood: task initiation, planning/prioritization, organisation, time management
- Higher order skills: time management, goal-directed persistence, metacognition
Sustained attention

Sustained attention is the ability to keep focused on something in spite of fatigue, distraction or boredom.

A person’s ability to sustain attention depends on novelty, intrinsic reinforcement (interest) value, extrinsically provided consequences.

If the task is fun, interesting and immediately rewarding, on-task behaviour can easily be sustained. Can we think of any such activities?

If a task is long, uninteresting, repetitive, a struggle to get through, there are potential distractors around or the person is tired, ability to sustain attention is challenged. Can we think of any such activities?
Sustained attention

Think of a child you know who struggles with sustained attention. What behaviours do you see? Discuss with a neighbour.
Behavioural observations for sustained attention

- rushes through or gives up quickly on tedious tasks
- stops working when an obstacle is encountered
- internally distracted (thoughts, states, moods, daydreams)
- externally distracted (sights, sounds, technology such as phone, computer, TV, video games)
- irrelevant talking in the middle of working
- not recognising when off-task
- needs to be reminded to get back to work
- not knowing limits (e.g. how long he can sustain attention) or when best study time is
Response inhibition

- The capacity to think before you react— to resist the urge to do or say something before you have had a chance to evaluate the situation and possible consequences.

Think of a child you know who struggles with response inhibition. What behaviours do you see? Discuss with a neighbour.
Behavioural observation for Response Inhibition

- answers questions without thinking
- gives up quickly on challenging tasks - not having patience to produce quality work
- gives a quick answer and then changes it
- answers question before it’s been asked
- tries to begin task without listening to all the instructions
- trial-and error approach to more challenging tasks - switches strategies quickly
- annoys peers by jumping in too quickly
Emotional control

- The ability to manage emotions to achieve goals, complete tasks, or control and direct behaviour

Think of a child you know who struggles with emotional control. What behaviours do you see? Discuss with a neighbour.
Behavioural observation for poor emotional control

- getting really irritated when a homework assignment is hard or confusing
- freezing when taking a test and doing poorly despite studying a long time
- not seeing the point of an assignment and finding it hard to motivate herself to do it
- difficulty managing disappointment or upset
- difficulty generating positive feelings as a way to overcome obstacles
- losing his/her temper or having a short fuse
- having difficulty getting over something to perform well in sports or music
EFs in ADHD

- Barkley’s theory of self-regulation
- Problem of self-control and behavioural inhibition - attention difficulties are secondary
- Difficulty controlling one’s behaviour by internal rules and standards
- Deficits in all EFs are the result of this fundamental difficulty
- Primarily due to biological reasons (not parenting)
- Implication is that they don’t lack the skill and knowledge, but can’t apply the knowledge in the moment - it’s a problem of doing rather than knowing
- Long-term goals don’t work!
Dopamine

- Dopamine is a neurotransmitter which is actively used in the frontal lobes.

- Children with Attention Deficit Hyperactivity Disorder release dopamine at a lower rate (have a dopamine deficit which is corrected with medication) hence their difficulty focusing.

- Dopamine also acts in the reward areas of the brain (the nucleus accumbent).

- This deficit means it is much harder for these kids to work up enthusiasm for something that isn’t inherently appealing.

- Implication: students with ADHD find it much more difficult to apply themselves to tasks that are not intrinsically interesting to them e.g. homework and chores.
Executive Functions Predict Educational Attainment

- The 1970s Marshmallow Experiment
Executive Functions Predict Educational Attainment

- There is a well established relationship between EFs and academic attainment.
- Studies show that executive functions — working memory and inhibition — predict academic success better than IQ tests.
- EF deficits predict academic impairments in children with ADHD.
Outline

- The importance of good EF for success in the academic environment
- Case Study – how weak EF can lead to a spiral of poor attainment and feelings of hopelessness
- Why are some students not reaching their potential?
## EF & success in the classroom

<table>
<thead>
<tr>
<th>Expectation</th>
<th>Executive Function Skills needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting still in class</td>
<td>Response inhibition, emotional control, sustained attention.</td>
</tr>
<tr>
<td>Following instructions from a teacher</td>
<td>Working memory, task initiation, response inhibition.</td>
</tr>
<tr>
<td>Answering/asking questions (putting your hand up)</td>
<td>Response inhibition, emotional control, sustained attention, working memory, flexibility.</td>
</tr>
<tr>
<td>Bringing tools needed for lessons</td>
<td>Working memory, organisation, planning and prioritisation, flexibility.</td>
</tr>
<tr>
<td>Punctuality</td>
<td>Working memory, organisation, planning and prioritisation, time management.</td>
</tr>
</tbody>
</table>
## EF & success in academic work

<table>
<thead>
<tr>
<th>Skill</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self Assessment</td>
<td>Metacognition, working memory,</td>
</tr>
<tr>
<td>Essay writing</td>
<td>Planning and prioritisation, task initiation, sustained attention,</td>
</tr>
<tr>
<td></td>
<td>organisation, metacognition</td>
</tr>
<tr>
<td>Class work</td>
<td>Task initiation, sustained attention, response inhibition, emotional</td>
</tr>
<tr>
<td></td>
<td>control, goal directed persistence, metacognition</td>
</tr>
<tr>
<td>Project work</td>
<td>Task initiation, sustained attention, planning and prioritisation,</td>
</tr>
<tr>
<td></td>
<td>organisation, response inhibition, emotional control, goal directed</td>
</tr>
<tr>
<td></td>
<td>persistence, metacognition</td>
</tr>
<tr>
<td>Revision</td>
<td>Task initiation, sustained attention, planning and prioritisation,</td>
</tr>
<tr>
<td></td>
<td>organisation, response inhibition, emotional control, goal directed</td>
</tr>
<tr>
<td></td>
<td>persistence, metacognition, flexibility</td>
</tr>
<tr>
<td>Exams</td>
<td>All of the above.</td>
</tr>
</tbody>
</table>
Adam Case - study

- Accepted into a prestigious secondary school with a good pass at 13+

- Years 9 - 11
  - Excellent verbally in lessons
  - Referred to as “lazy” by teachers
  - Late to lessons
  - Constantly leaving belongs behind
  - Poor homework record
  - Easily distracted by peers
  - Essays “all over the place”
  - Regularly in detention to no effect
  - “Poor” GCSE results some As Bs Cs and Ds
  - Advised not to remain for A Levels.
Adam Case - study

- Accepted into less academic secondary school for A Level
- Diagnosis ADHD
- Year 12
  - Severe crisis of confidence
  - Rude to teachers
  - Distractible in class & prep time
  - No notes from classes
  - Unable to do any independent work
  - Unable to plan revision schedule
  - Reliant on tutors as a “crutch”
  - Poor relationship with Parents
  - Predicted Us at A level
CAT Scores

- Cognitive ability scores – used by schools to predict outcomes at GCSE Level
CAT Scores – students who do not reach their potential

- Every school has students whose performance tales off throughout their career.
  - Students who contribute well in the classroom, but can’t seem to get their thoughts down on paper in a structured manner.
  - Students who forget homework, miss coursework deadlines.
  - Students who are easily distracted during, lessons, prep and revision.

WHY?
Expectations of strong EFs at school

- Not only does the school environment expect good executive function
- Expectations of “normal” development of EF skills are embedded in the curriculum at all stages
- There are very few schools in the UK teaching EFs
- This is compounded by Examination boards including expectations of strong EFs in their Assessment Objectives
How are EFs embedded in the assessment objectives?

- Analyse AO
  - 13+ English

- Identify areas where EFs are expected.

- Feedback to the room.
British Curriculum Challenges

ASSESSMENT OBJECTIVES

AT 11+
By the time candidates sit the examination, they should be able to:

AO1 read a substantial passage unaided and give independent written responses to questions involving a range of comprehension skills;

AO2 write unaided at reasonable length on one topic selected from a choice of work suitable for the age range.

AT 13+
Candidates should be able to:

AO3 read substantial passages unaided and give independent written responses to questions requiring a range of comprehension skills;

AO4 show evidence of independent literary work both with an unprepared text and with texts studied during their time in junior school;

AO5 show evidence of original creative work in the form of their choice within the limitation of a timed examination.
# APPENDIX I

## WRITING TASK ASSESSMENT AT 13+

### Paper 1 Essays 1-3 and Paper 2 Essays

<table>
<thead>
<tr>
<th>Mark</th>
<th>Descriptors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 11</td>
<td>Not relevant to the chosen task; clarity weak owing to poor and technical inaccuracy; very short and undeveloped with little attention to detail.</td>
</tr>
<tr>
<td>12 – 15</td>
<td>Generally relevant to the task; ideas clearly communicated and organised into paragraphs; some attention to detail; style and tone generally appropriate for the chosen task; spelling sufficiently accurate.</td>
</tr>
<tr>
<td>16 – 19</td>
<td>Mainly relevant to the task; ideas clearly communicated and well structured in an effective and interesting way; good attention to detail; style and tone adapted well for the chosen task; spelling generally accurate; a good range of vocabulary and expression.</td>
</tr>
<tr>
<td>20 – 25</td>
<td>Consistently relevant to the task; ideas developed fully and well structured in an original and stylish way; excellent attention to detail; essay much enhanced by style and tone; spelling consistently accurate; a wide range of vocabulary and expression.</td>
</tr>
</tbody>
</table>
Summary

- EF are essential to engage successfully in the school environment
- They are also examined in public exams.
- Most schools do not teach Executive Functions (Yet)
**Intervention**

- The evidence
- Brain development tells us - do it again and again and again (and do it without stress)
- Change the way adults interact with the child
- Modify task
- Teach the skill
- Coaching
<table>
<thead>
<tr>
<th>Intervention</th>
<th>Evidence</th>
</tr>
</thead>
</table>
| Computer games - Cogmed/Jungle Gym | • Jungle Memory training has been found to lead to improvements in children’s working memory, vocabulary and math post-training (Alloway, 2012). There were some maintenance effects when students were tested 8 months later (Alloway et al, 2014).  
  
  • Cogmed has been found to increase working memory (Brehmer et al., 2012, Klingberg et al., 2002; 2005, Thorell et al., 2009) up to six months after Cogmed (Holmes et al., 2009), including increased ability to follow instructions (Holmes et al., 2009) and to remember and add digits (Westerberg et al. 2007).  
  
  • However it is not clear that the positive effects of working memory training programs generalise to the classroom or that the effects are even sustained (Lervåg et al, 2012)  
  
  • Another review of Cogmed argued that many of the problem-solving or training tasks are not related to working memory or ADHD, and that there is limited transfer to real-life manifestations of attention deficits (Shipstead et al, 2012). |
Lumosity to Pay $2 Million to Settle FTC Deceptive Advertising Charges for Its “Brain Training” Program

Company Claimed Program Would Sharpen Performance in Everyday Life and Protect Against Cognitive Decline

FOR RELEASE

January 5, 2016

TAGS: Bureau of Consumer Protection | Consumer Protection | Advertising and Marketing | Health Claims | Online Advertising and Marketing

The creators and marketers of the Lumosity “brain training” program have agreed to settle Federal Trade Commission charges alleging that they deceived consumers with unfounded claims that Lumosity games can help users perform better at work and in school, and reduce or delay cognitive impairment associated with age and other serious health conditions.

As part of the settlement, Lumos Labs, the company behind Lumosity, will pay $2 million in redress and will notify subscribers of the FTC action and provide them with an easy way to cancel their auto-renewal to avoid future billing.

“Lumosity preyed on consumers’ fears about age-related cognitive...
## Executive Function Interventions for Primary and Secondary Aged Children

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise &amp; Martial Arts</td>
<td>Aerobic running improved 8–12 year-olds’ cognitive flexibility and creativity more than participating in standard Physical Education classes (Tuckman &amp; Hinkle, 1985)</td>
</tr>
<tr>
<td></td>
<td>40 minutes a day of aerobic exercise improved EFs and Maths ability (Davis et al, 2011)</td>
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<tr>
<td></td>
<td>Martial arts emphasize self-control and discipline (inhibitory control). Children getting traditional Tae-Kwon-Do training were found to show greater gains than children in standard physical education on all dimensions of EFs studied (Lakes et al, 2004).</td>
</tr>
</tbody>
</table>
### Executive Function Interventions for Primary and Secondary Aged Children

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mindfulness meditation and Yoga</td>
<td>After mindfulness training, children with initially poor EFs showed EF improvements overall and in the components of shifting and monitoring, bringing their scores up to average (Flook et al, 2010).</td>
</tr>
<tr>
<td>Classroom Curriculum and Classroom Based Support</td>
<td>Promoting Alternative Thinking Strategies (PATHS) trains teachers to build children’s competencies in self-control, recognizing and managing feelings, and interpersonal problem-solving. After a year of PATHS, 7–9 year-olds showed better inhibitory control and cognitive flexibility than control children (Riggs et al, 2006). When teachers implement strategies in the classroom that support student with poor working memory it predicted educational attainment (Gathercole et al, 2010).</td>
</tr>
<tr>
<td>Intervention</td>
<td>Evidence</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Coaching plus organisational skills</td>
<td>Coaching for secondary schools students with ADHD was found to increase homework hand in rates (Merriman &amp; Codding, 2008)</td>
</tr>
<tr>
<td></td>
<td>Teaching students life and school organisational skills led to improvements in grades (Anderson et al, 2008).</td>
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<tr>
<td></td>
<td>ADHD coaching improves university students’ learning skills, self-regulation, and well-being (Field et al, 2013).</td>
</tr>
<tr>
<td></td>
<td>ADHD coaching with university students improves goal attainment skills and helps students achieve a greater sense of well-being and self-regulation (Parker et al, 2011).</td>
</tr>
<tr>
<td></td>
<td>An 8-week ADHD coaching program showed significant improvement in study and learning strategies, on self-esteem, and on measures of symptom distress and satisfaction with school and work (Prevatt &amp; Yelland, 2015).</td>
</tr>
</tbody>
</table>
Repetition

- Develop new pathways
- Develop habits
- Reinforce
- Move from external to internal control
- (lower vs higher order brain functioning)
- Spacing
Where we understand emotions and manage and control behaviour
Change the way adults interact with child

- Stress, anxiety and anger reduce functioning in frontal lobes, thereby reducing child’s ability to use skills or reflect on experience

- Open-minded and non-judgemental space
Modify task

- Change the environment
Strategies to help with sustained attention

- reduce distractions (seating arrangements)
- prompt to attend (look, listen, respond)
- modify/limit task length or demand (end in sight)
- build in variety or choice
- choose best time of day
- immediately reinforce
- use sand timers/ timetimer/ fidget toys such as stress balls
Strategies to help with response inhibition

- increase external controls
- set child up to succeed (lower expectations, remove items if necessary) and prepare well
- outline rules and review regularly
- assume that the presence of peers in teen years will have reduced impulse control
- expect your child (particularly teen) to choose fun activities over challenging or non pleasurable ones
Strategies to help with emotional control

- reduce or eliminate triggers
- give child a script to follow
- forewarn of potentially difficult situations and have empathy when it’s hard
- remove child from problem situation
- teach child to recognise situations or early signs
- rehearse the strategy repeatedly until it’s internalised
Teach the skill

- Coaching
Connections in Mind

- The only UK company focused on how to support children’s developing executive functions through coaching.

- All three of the founders having worked one on one supporting children with EFs and they all felt frustrated about the lack of strategies to support children and schools with developing executive functions.

- We currently offer one to one coaching and we are also launching parenting groups and partnerships with schools.

- There is a strong relationship between poverty and executive function deficits and we are committed to developing affordable and pro-bono services for children in state sectors schools and pupil referral units.
What We Offer

- **Evidence Based Coaching Model – Smart but Scattered.** An established model developed 13 years ago in the US. It has been evaluated in the states and we are going to be evaluating it here.

- **Coaching for Independent Learning** - Over 11s executive function one to one coaching

- **Under 11s** - one to one executive function coaching

- **Parenting for Connected Minds** - one to one and group parenting support for parents with children with executive function deficits.
Coaching for Independent Learning

- Executive Function Student Evaluation and Parent Interview
- Long term and short term goals are established
- Coach and student agree three short term goals to work on
- Daily check-ins over Skype for 4-8 weeks which are 15-30 minute long and one 1 hour session (over Skype or face to face) which focuses on developing a specific skill such as:
  - Note taking
  - Organising school books
  - Routine
  - Essay planning
Case Study Emily - 12 years old

<table>
<thead>
<tr>
<th>Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get bag ready the night before</td>
</tr>
<tr>
<td>Stick to a revision plan</td>
</tr>
<tr>
<td>Hand homework in on time 90% of the time</td>
</tr>
</tbody>
</table>
Case Study Emily - 12 years old

• She was extrinsically motivated to begin with. We encouraged her with star charts which led to rewards and lots of praise about how hard she was working. She increasingly became intrinsically motivated after tasting success.

• By the end of 8 weeks she was:
  ○ packing her bag 80% of the time
  ○ handing in her homework on time 90% of the time
  ○ she had planned and organised her own revision timetable and was sticking to it most of the time.
Adam

· Interventions
  · Intensive Coaching for 6 weeks
  · Twice Weekly check-ins, reverting to daily in Easter holidays.
  · Skills sessions: essay writing, attention in class, keeping track of homework and projects, task initiation, emotional control.

· Outcomes
  · Boosted confidence (fixed to growth mindset)
  · Writing skills dramatically improved.
  · Improved relationship with his parents.
  · Improved grades at end of Year 13.
The coaching recipe for success

- Open ended questions encourages metacognition
- Led by the child – promotes the child taking responsibility
- Specific praise promotes a growth mindset
- Daily check-ins help to create habits
- Rapport and trust between the coach and student
Under 11s

- Executive Function Student Evaluation and Parent Interview
- Long term and short term goals are established
- Coach and student agree three short term goals to work on
- Coach agrees with child and parent the focus of 8 weekly face to face 1.5 hour sessions
Under 11s

- Each session is divided into three parts:
  - Life Skills
  - Academic Skills
  - Social and Emotional Skills
- Parent or caregiver reinforces the skill during the week
- Each week the parent or caregiver and coach check-in over Skype for half an hour to troubleshoot
Our Coaches

• All of our coaches have a background in Psychology or Education

• They have all been selected because they have demonstrated a passion for supporting children to reach their potential and they have the pre-requisite skill set to successfully coach children and young people

• They have been trained by the Connections in Mind team in the executive function coaching model, communication, child mental health and safeguarding

• All our coaches are DBS checked

• We are committed to their ongoing professional development. All of our coaches are supervised by one of our directors. We also hold regular training and seminars for our coaches.

• The relationship is key
Parenting for Connected Minds

- We are launching an 8 week parenting course for parents of children with executive function deficits. The course will include:
  - Brain Development
  - Executive Functions
  - Communication
  - Being emotionally available to your child
  - Parenting pitfalls
  - Sustaining good habits
  - Managing your own stress and frustrations
Evaluating our Work

- Social and emotional wellbeing
- Goal attainment
- Change in executive functions
- Parent Child relationships
- The importance of rapport with the coach
- Grades
Looking Forwards

· **School partnerships** – we would like to partner with both independent and state sectors schools to pilot classroom based executive function strategies and also peer to peer, group and school based coaching. We are also interested in training educational professionals and teaching assistants about executive functions, brain development and executive function coaching.

· **Available to all** - we are committed to developing our interventions to make them available to children and young people from low socio-economic backgrounds.
Thank you for attending and please don’t hesitate to get in touch if you have any questions.