

**Supplementary Table 1.** Operational definitions, behavioral indicators, and 75 items.

Subcomponents	Behavioral indicators	Items
<p><b>Cognitive inhibition</b></p> <p><i>Definition: the ability to suppress thoughts or memories that are unwanted (internal distractions)</i></p>	<p>1. Be able to suppress thoughts or memories that are not currently relevant or are unwanted.</p> <p>2. To stop thinking about things that are not important or ruminating on negative thoughts.</p> <p>3. Inhibit interference of old or new data.</p>	<p>1. I don't let extraneous thoughts, like maybe what's for dinner, interrupt my concentration when doing schoolwork.</p> <p>2. While studying in class, I reminisce about the old days instead of focusing on the lesson. (R)</p> <p>3. I am absent-minded while studying. (R)</p> <p>4. I can stop distracting thoughts while having a conversation with others.</p> <p>5. Even though thoughts about other things might pop up while working on a report, I can stop those thoughts.</p> <p>6. I get distracted by other thoughts while doing group work. (R)</p> <p>7. I can focus on the present.</p> <p>8. I spend a lot of time thinking about one or more mistakes I've made in the past. (R)</p>
<p><b>Selective attention</b></p> <p><i>Definition: the ability to selectively focus or concentrate while ignoring distractors in the environment (external distractions, i.e., ignoring visual or auditory information not relevant to the task at hand).</i></p>	<p>1. Focus on relevant stimuli and ignore unimportant or irrelevant stimuli.</p> <p>2. Screen out stimuli that are not relevant to what you need or want to do at the moment.</p>	<p>1. When biking or driving, I am able to focus on the road and not be distracted.</p> <p>2. When I go shopping, I can get distracted by things I wasn't planning to buy and may not need. (R)</p> <p>3. Even though there is a disruptive question or comment while I am presenting my classwork, I can continue and smoothly present my classwork.</p> <p>4. I can focus on what someone is saying to me even when the environment is very noisy.</p> <p>5. While working on a report, if the music is on, I get distracted. (R)</p> <p>6. I can continue to concentrate on reading a book even when a TV program comes on.</p>

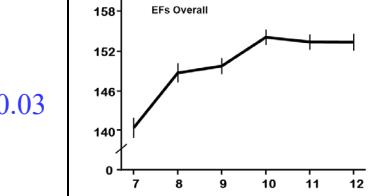
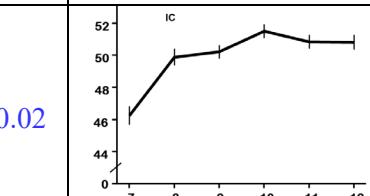
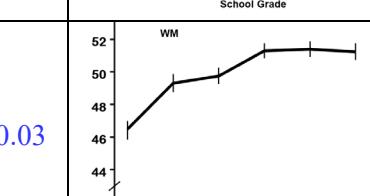
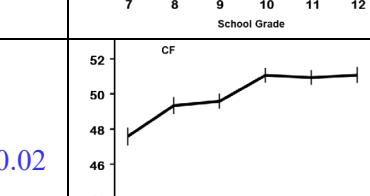
Subcomponents	Behavioral indicators	Items
		<p>7. I focus on the workload that I am working on without letting noise in the room bother me.</p> <p>8. In class, I get distracted by things in the room or things I can see through the window. (R)</p>
<p><b>Self-control</b></p> <p><i>Definition: resisting temptations and not reacting impulsively. It means the ability to think before acting so that you give a considered response rather than an impulsive one.</i></p>	<p>1. Control behaviors.</p> <p>2. Wait patiently.</p> <p>3. Does not respond to temptation.</p> <p>4. Think before speaking or acting.</p>	<p>1. If someone says or does something that hurts me, I am able to resist doing something unkind to that person.</p> <p>2. I can be too impetuous, acting on my emotions or instinct, instead of carefully considering what I should do. (R)</p> <p>3. I do not interrupt while others are speaking.</p> <p>4. I patiently wait to buy the products I want until they are available at a lower price.</p> <p>5. I think and ponder before speaking or acting.</p> <p>6. I do not try to butt ahead in line.</p> <p>7. I immediately speak my thoughts. (R)</p> <p>8. I interrupt someone who is speaking, especially if I think I know what the person is about to say. (R)</p>
<p><b>Discipline</b></p> <p><i>Definition: persevering despite resist all the temptations to quit and not finish what you started.</i></p>	<p>1. Resisting all the temptations to quit and not finish what you started (too boring, too hard).</p>	<p>1. Even though something might be a lot harder and take a lot longer than I expected, I keep at it until it is finished.</p> <p>2. If I am determined to do something, then I have to accomplish it.</p> <p>3. If something is boring, I tend to lose interest and end up not completing it, even if it is required. (R)</p> <p>4. I tend to quit midway through doing something. (R)</p> <p>5. I have good intentions at first, but tend to give up. (R)</p> <p>6. When my friends call me to join them in doing something fun, I tend to abandon my work, even though unfinished, and join them. (R)</p>

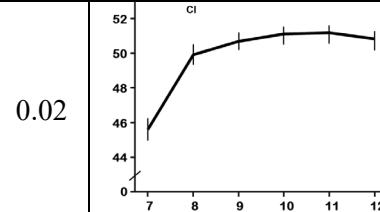
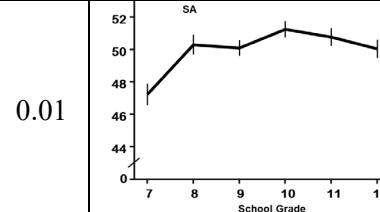
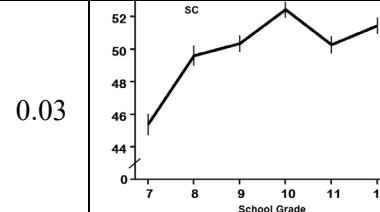
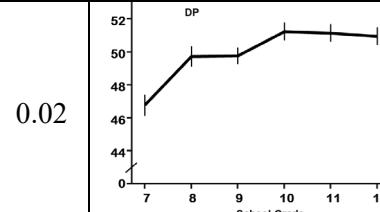
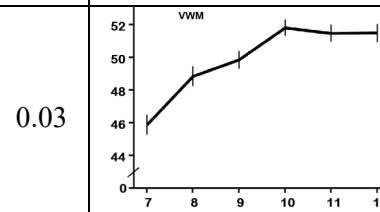
Subcomponents	Behavioral indicators	Items
		<p>7. I do what I am supposed to do, even if I don't want to.</p> <p>8. I have a lot of trouble finishing what I start. (R)</p>
<p><b>Verbal working memory</b></p> <p><i>Definition: the ability to hold in mind and manipulating verbal material, such as relating what you read earlier to what you are reading now, having a mental argument with oneself, building a mental case for something, adding numbers in your head, or mentally alphabetizing a list or re-ordering digits into numerical order.</i></p>	<p>Mentally work with or manipulate words, numbers, or concepts you are holding in mind.</p>	<p>1. I am able to mentally put information I hear in the correct and sequential order.</p> <p>2. If I want to re-order a to-do list, I need to write it down rather than try to do this all in my head. (R)</p> <p>3. I can mentally calculate whether I have enough money to purchase all the items I might want to buy.</p> <p>4. If the teacher gives multi-step instructions, I forget one or more of the steps or their correct order. (R)</p> <p>5. I am good at relating what I am learning now to other things I learned earlier.</p> <p>6. If someone interrupts the conversation, I do not remember what I was going to say. (R)</p> <p>7. If I have a question or comment, I can follow the ongoing conversation or lecture and still remember what I was going to say when the time comes to say or ask it.</p> <p>8. I need to write the numbers down to do any math calculation. (R)</p> <p>9. I am good at seeing the connections between something new I learn or hear and other things I already knew.</p> <p>10. I can compare and contrast new situations with old ones for decision-making.</p> <p>11. I consider the pros and cons of each alternative to select the best way to solve the problem.</p>
<p><b>Visual-spatial working memory</b></p> <p><i>Definition: the ability to mentally process visual-spatial information held in mind. One might use this, for example, to mentally compare the sizes of two objects or two spaces, to mentally reconstruct a scene with its various components,</i></p>	<p>Mentally work with or manipulate spatial or visual information.</p>	<p>1. I am able to mentally sort or re-order items by size without needing to see them again or write anything down.</p> <p>2. I am able to memorize the route/directions after the first trip.</p>

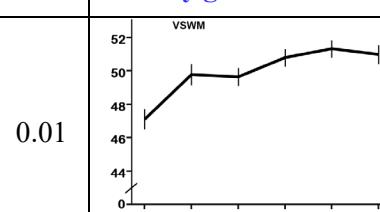
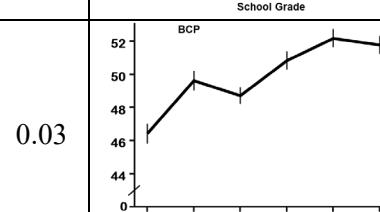
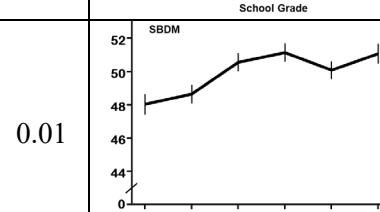
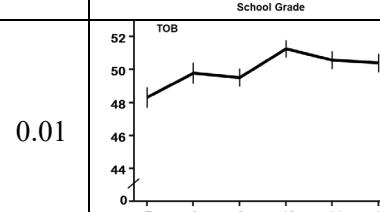
Subcomponents	Behavioral indicators	Items
<p><i>or to remember which of various locations have already been searched.</i></p>		<p>3. I can mentally calculate the distance to know which route is longer or shorter.</p> <p>4. If I need to do several errands, I can mentally calculate the most efficient route.</p> <p>5. If shown a set of objects, if they are moved around, I have trouble remembering where they were initially. (R)</p> <p>6. Even if two shapes are quite close in size, I can tell which is larger without having to physically put them next to one another.</p> <p>7. If I follow someone along a route to get somewhere I haven't been before, I can find my way back without difficulty.</p> <p>8. When working on a jigsaw puzzle, I can tell whether a piece will fit in a certain place or not before actually placing it there.</p> <p>9. I have difficulty seeing in my mind's eye how a wall would look if the things hanging on it were rearranged. (R)</p> <p>10. I find it difficult to mentally order items by size, I need to see the items. (R)</p>
<p><b>Being able to Change Perspectives</b></p> <p><i>Definition: the ability to change one's way of thinking about something, to perceive problems from different perspectives or look at problems from a new perspective.</i></p>	<p>1. Seeing problems from new perspectives.</p> <p>2. Conceiving of the problem, frame problem, in a whole new way.</p> <p>3. Coming up with a completely different way of attacking problem.</p>	<p>1. I am able to switch from seeing something as an unwelcome problem to seeing it as a welcome challenge.</p> <p>2. Amidst the bad, I can still see the good things that are hidden.</p> <p>3. I always find a way to succeed despite obstacles.</p> <p>4. I am able to change my mindset to focus on the present and to enjoy every problem I face.</p> <p>5. I am able to see opportunities hidden in life's crises.</p> <p>6. I can turn obstacles into opportunities for self-improvement.</p>
<p><b>Switching between different mindsets or tasks</b></p> <p><i>Definition: the ability to flexibly switch back and forth between two</i></p>	<p>1. Switching between two tasks.</p> <p>2. Switching between focusing on one attribute (say, shape)</p>	<p>1. I have difficulty switching between cooking dinner, answering the phone, and doing my homework. (R)</p>

Subcomponents	Behavioral indicators	Items
<p><i>tasks, to switch between styles (e.g., loud vs. quiet or in a rush vs. taking your time), for example, the switching between cooking and having a conversation or the switching between characteristics such as shapes and colors.</i></p>	<p>and another attribute (say, color)</p>	<p>2. I am able to switch my focus among having a conversation with my friends, summarizing report contents, and arranging figures for presentation.</p> <p>3. I have difficulty changing my mindset if I fully believe in something. (R)</p> <p>4. I am able to switch my thoughts between focusing on color to focusing on shapes or numbers.</p> <p>5. I am able to talk on the phone while doing other activities.</p> <p>6. I can read books and watch TV at the same time.</p> <p>7. I can have a conversation with different people on a variety of topics at the same time.</p> <p>8. I can mentally calculate while holding a conversation with friends.</p>
<p><b>Thinking outside the box</b></p> <p><i>Definition: the ability to use new approaches to solve a problem.</i></p>	<p>1. Solving problems creatively.</p> <p>2. Think outside the old box.</p> <p>3. Changing problem solving methods.</p>	<p>1. I have difficulty changing the way I go about trying to solve a problem even if the method I've been using doesn't seem to be working. (R)</p> <p>2. I have trouble coming up with new ways to solve a problem. (R)</p> <p>3. I cannot think of alternative ways to solve a problem. (R)</p> <p>4. I can find solutions to problems that others cannot see.</p> <p>5. I am able to find a better method for solving problems, although the old method worked.</p> <p>6. I tend to have different ideas from others about clothing, designing, etc.</p> <p>7. I always follow others' ideas without finding a new way. (R)</p> <p>8. I follow tradition. (R)</p>

**Supplementary Table 2.** Results of the Linear Regression comparing the EF performance of Thai adolescents by their Grade Level in School.

EF Variable	Mean (sd)						Regression Results for Differences by Grade Level			
	Grade 7 (N = 286)	Grade 8 (N = 273)	Grade 9 (N = 343)	Grade 10 (N = 313)	Grade 11 (N = 329)	Grade 12 (N = 321)	F-value	R <sup>2</sup>	Graph of results by grade level	Direction of Difference
Overall Executive Functions	140.34 (25.73)	148.56 (23.72)	149.59 (22.24)	153.91 (20.67)	153.21 (21.09)	153.17 (22.76)	55.10	0.03		Gr 7 < 8 Gr 7 < 9 Gr 7 < 10 Gr 7 < 11 Gr 7 < 12
Inhibitory Control	46.25 (9.60)	49.89 (8.63)	50.23 (7.91)	51.52 (7.53)	50.85 (8.01)	50.83 (8.06)	43.50	0.02		Gr 7 < 8 Gr 7 < 9 Gr 7 < 10 Gr 7 < 11 Gr 7 < 12
Working Memory	46.50 (9.58)	49.32 (9.35)	49.76 (9.14)	51.31 (8.18)	51.40 (8.65)	51.25 (9.04)	51.87	0.03		Gr 7 < 8 Gr 7 < 9 Gr 7 < 10 Gr 7 < 11 Gr 7 < 12
Cognitive Flexibility	47.59 (8.79)	49.35 (8.23)	49.60 (8.03)	51.08 (7.36)	50.95 (7.65)	51.10 (8.21)	37.29	0.02		Gr 7 < 9 Gr 7 < 10 Gr 7 < 11 Gr 7 < 12

EF Variable	Mean (sd)						Regression Results for Differences by Grade Level			
	Grade 7 (N = 286)	Grade 8 (N = 273)	Grade 9 (N = 343)	Grade 10 (N = 313)	Grade 11 (N = 329)	Grade 12 (N = 321)	F-value	R <sup>2</sup>	Graph of results by grade level	Direction of Difference
Cognitive inhibition	45.62 (10.75)	49.94 (9.83)	50.71 (9.48)	51.14 (9.20)	51.21 (9.82)	50.85 (9.95)	38.88	0.02		Gr 7 < 8 Gr 7 < 9 Gr 7 < 10 Gr 7 < 11 Gr 7 < 12
Selective attention	47.23 (11.25)	50.31 (10.18)	50.11 (9.21)	51.27 (8.98)	50.78 (10.03)	50.05 (10.02)	11.55	0.01		Gr 7 < 9 Gr 7 < 10 Gr 7 < 11 Gr 7 < 12
Self-control	45.38 (11.28)	49.60 (10.26)	50.34 (9.49)	52.43 (8.69)	50.27 (9.68)	51.44 (9.30)	49.91	0.03		Gr 7 < 8 Gr 7 < 9 Gr 7 < 10 Gr 7 < 11 Gr 7 < 12 Gr 8 < 10
Discipline	46.78 (10.91)	49.73 (10.29)	49.77 (9.39)	51.24 (9.54)	51.15 (9.75)	50.96 (9.65)	30.42	0.02		Gr 7 < 8 Gr 7 < 9 Gr 7 < 10 Gr 7 < 11 Gr 7 < 12
Verbal working memory	45.88 (10.58)	48.85 (9.96)	49.86 (10.06)	51.82 (8.83)	51.48 (9.46)	51.51 (9.92)	62.52	0.03		Gr 7 < 8 Gr 7 < 9 Gr 7 < 10 Gr 7 < 11 Gr 7 < 12 Gr 8 < 10

EF Variable	Mean (sd)						Regression Results for Differences by Grade Level			
	Grade 7 (N = 286)	Grade 8 (N = 273)	Grade 9 (N = 343)	Grade 10 (N = 313)	Grade 11 (N = 329)	Grade 12 (N = 321)	F-value	R <sup>2</sup>	Graph of results by grade level	Direction of Difference
Visual Spatial working memory	47.12 (10.22)	49.78 (10.33)	49.65 (10.00)	50.80 (9.34)	51.33 (9.57)	50.99 (10.10)	27.35	0.01		Gr 7 < 10 Gr 7 < 11 Gr 7 < 12
Being able to change perspectives	46.42 (9.94)	49.63 (10.04)	48.72 (9.47)	50.84 (9.74)	52.20 (10.02)	51.80 (9.77)	60.81	0.03		Gr 7 < 8 Gr 7 < 10 Gr 7 < 11 Gr 7 < 12 Gr 9 < 11 Gr 9 < 12
Switching between different mindsets	48.03 (10.39)	48.64 (9.25)	50.57 (10.26)	51.15 (9.63)	50.09 (9.45)	51.09 (10.55)	16.70	0.01		Gr 7 < 10 Gr 7 < 12 Gr 9 < 12
Thinking outside the box	48.32 (10.54)	49.78 (10.42)	49.51 (10.01)	51.26 (9.39)	50.57 (9.56)	50.40 (9.99)	9.02	0.01		Gr 7 < 10

Legend: sd = standard deviation. All F-values are significant at  $p < .001$ , except for Thinking outside the box, which was significant at  $p = .003$ . Only pairwise comparisons that were significant that  $p < .001$  are listed in the last column.