

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

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

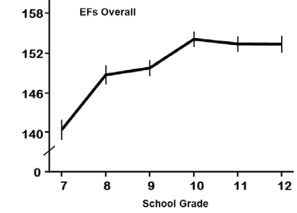
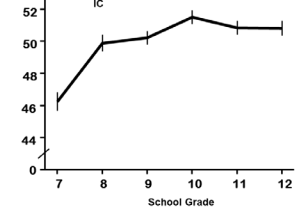
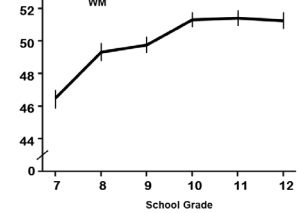
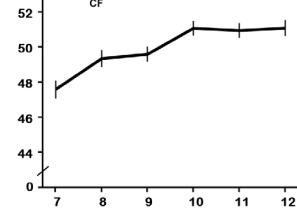
Subcomponents	Behavioral indicators	Items
		<p>7. I focus on the workload that I am working on without letting noise in the room bother me.</p> <p>8. In class, I get distracted by things in the room or things I can see through the window. (R)</p>
<p>Self-control</p> <p><i>Definition: resisting temptations 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>Discipline</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>

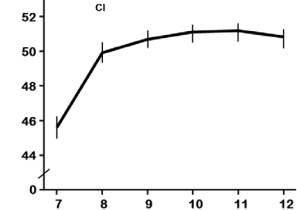
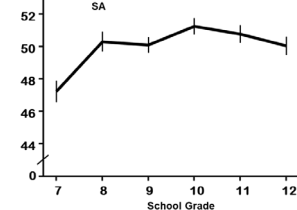
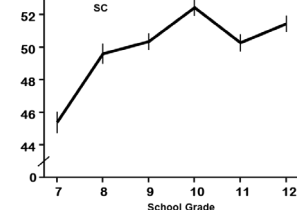
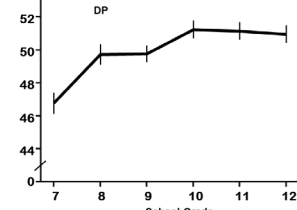
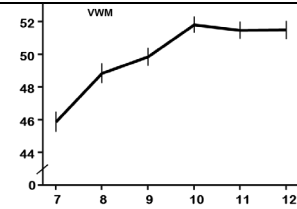
Subcomponents	Behavioral indicators	Items
		<p>7. I do what I am supposed to do, even if I don't want to.</p> <p>8. I have a lot of trouble finishing what I start. (R)</p>
<p>Verbal working memory</p> <p><i>Definition: the ability to hold in mind and manipulating verbal material, such as relating what 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>Visual-spatial working memory</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>

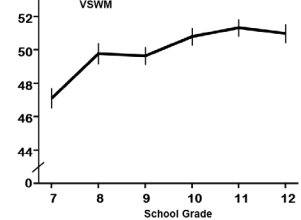
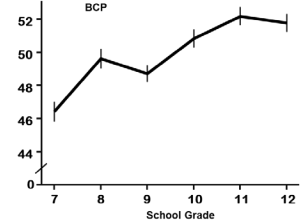
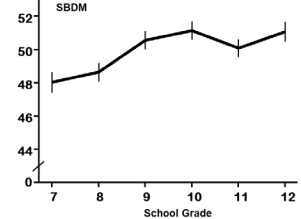
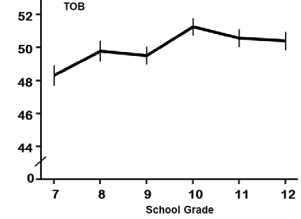
Subcomponents	Behavioral indicators	Items
<i>or to remember which of various locations have already been searched.</i>		<p>3. I can mentally calculate the distance to know which route is longer or shorter.</p> <p>4. If I need to do several errands, I can mentally calculate the most efficient route.</p> <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>Being able to Change Perspectives</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>Switching between different mindsets or tasks</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>

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<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>Thinking outside the box <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 the 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 (<i>sd</i>)						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 ²	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 (<i>sd</i>)						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 ²	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 ²	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.