

EXECUTIVE FUNCTIONS MEASURES

- **Attentional Inhibition tasks**

Modified Flanker Task (Pontifex, Saliba, Raine, Picchiatti, & Hillman, 2013). In this task, target-flanker arrays of fish are presented either in the same direction (congruent trials) or in the opposite direction (incongruent trials). Congruent/incongruent arrays have the same probability of being presented. The task is to determine as quickly and accurately as possible the direction that the middle (i.e. target) fish is facing. The flanking fish serve as distractors during that decision process. All trials are presented for a duration of 200 ms, with a fixed inter-trial interval (1700 ms). After a block of 20 practice trials, participants have to complete two blocks of 50 trials (congruent and incongruent trials are mixed).

Go/No-Go task (Kamijo et al., 2012). In the first part of task (1st block), children have to press the response button to rare-target stimuli (a lion picture, 0.2 probability), presented together with frequent non-target stimuli (picture of a tiger, 0.8 probability) that do not require a response. Then children perform the second part of the task (2nd block), in which they have to press a button to frequent-target stimuli (tiger, 0.8 probability), and withheld from responding to rare-non-target stimuli (lion, 0.2 probability). A fixed task order is set to create conflict relative to inhibitory control during the second part of the task. All trials are presented for a duration of 200 ms, with a fixed inter-trial interval (1700 ms). The task contains 20 practice trials per block and two blocks of 100 trials.

Classic Simon Task (adapted from Morton & Harper, 2007). In this task, a red square or a blue square are presented on the left or right side of the computer screen. Each stimulus is associated with a response key (e.g. red square=left and blue square=right). The children's task is to press the appropriate response key whether the stimulus appears on the left or right side of the screen. In congruent trials, the stimulus appears on the same side of the screen as the response key to which it is associated (e.g. left-left); whereas in incongruent trials, it appears on the opposite side (e.g. left-right). All trials are presented for a duration of 1000 ms, with a fixed inter-trial interval (500 ms). After 8 practice trials, participants have to complete 2 blocks of 32 trials of congruent and incongruent trials mixed.

- **Working Memory tasks.**

Letter memory task (adapted from Tamnes et al., 2010). Letters are presented serially, for 2,000 ms each, in the center of the computer screen. The number of letters presented (5, 7, 9, or 11) varies randomly across trials. Each list of letters (5, 7, 9 or 11) is presented four times, for a total of 16 trials. Children's task is to recall the last three letters presented in each list.

Backwards digit-span task (Wechsler, 1991). In this task children have to repeat aloud the numbers they have just heard in reverse order. The test starts with three series of two digits, if the child correctly recalls two out of three series the test continues, and the number of digits increases progressively until reaching children's span capacity. The test stops when children cannot recall at least two out of three series. The longest sequence correctly recalled is considered as children working memory span.

Spatial n-back task (adapted from Drollette, Shishido, Pontifex, & Hillman, 2012). The nature of the n-back task is to provide a continuous load on working memory, requiring updating and reorganization of memory representations. For each trial, a schematic yellow happy face appears pseudo-randomly inside one of the six boxes. For the 0-back condition, participants are instructed to respond as quickly and accurately as possible with a right button press when the schematic face appears in the upper left box (i.e., target) and with a left button press when it appears in any of the remaining five boxes (i.e., correct reject). For the 1-back and 2-back conditions, participants are instructed to press a right button if the schematic face appears in the same box as the previous trial (1-back condition) or in the same box as two trials back (2-back condition), otherwise they have to press the left-button. 1-back and 2-back conditions are counterbalanced across participants. All trials are presented for a duration of 250 ms with a fixed inter-stimulus interval of 2500 ms. Each task condition has 45 trials (and 15 targets) and it is preceded by 20 practice trials.

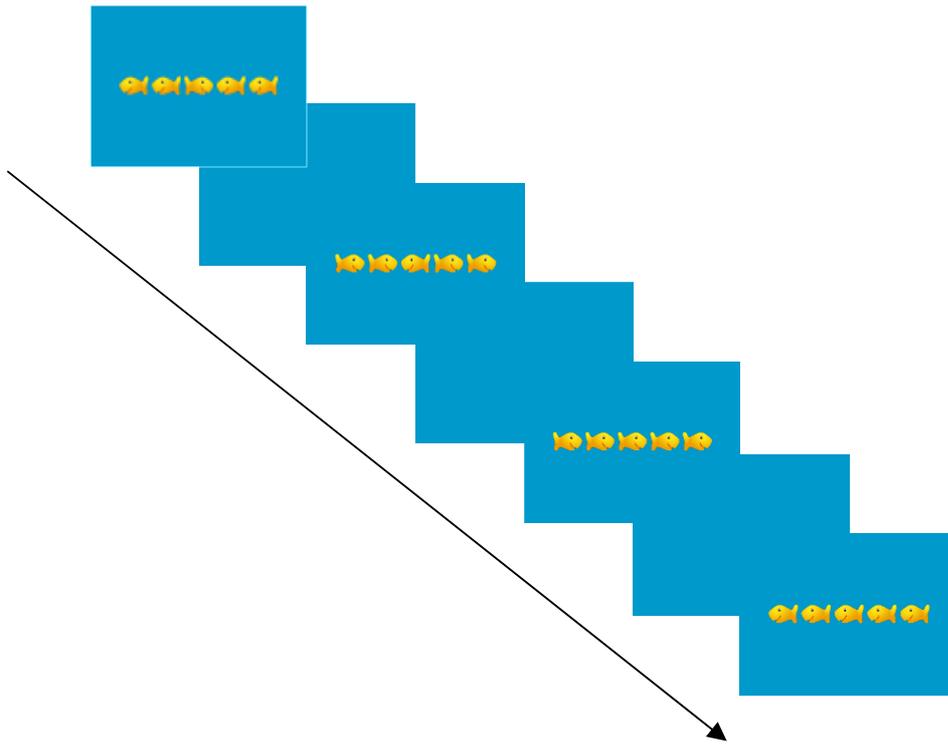
- **Cognitive Flexibility tasks**

Color-Shape switch Task (Espy, 1997). This task requires children to judge the color (circle or square) or shape (blue or green) of the stimulus presented and press the appropriate response button. This task includes two conditions, the homogeneous condition (blocks of trials requiring a response only to the color of the stimuli; blocks of trials requiring a response only to the shape of the stimuli), and the heterogeneous condition, which contains a mixed rule-set of cues to flexibly shift attention towards the correct target feature (arms down indicates

respond to the color of the stimulus; arms up respond to the shape). In the first part of the task children perform the homogeneous blocks and then, they perform the heterogeneous blocks. All trials are presented for a duration of 3000 ms, with a fixed inter-trial interval (3500 ms). The task contains 176 trials (80 homogeneous condition / 96 heterogeneous condition). In the heterogeneous condition, switching trials are unpredictable.

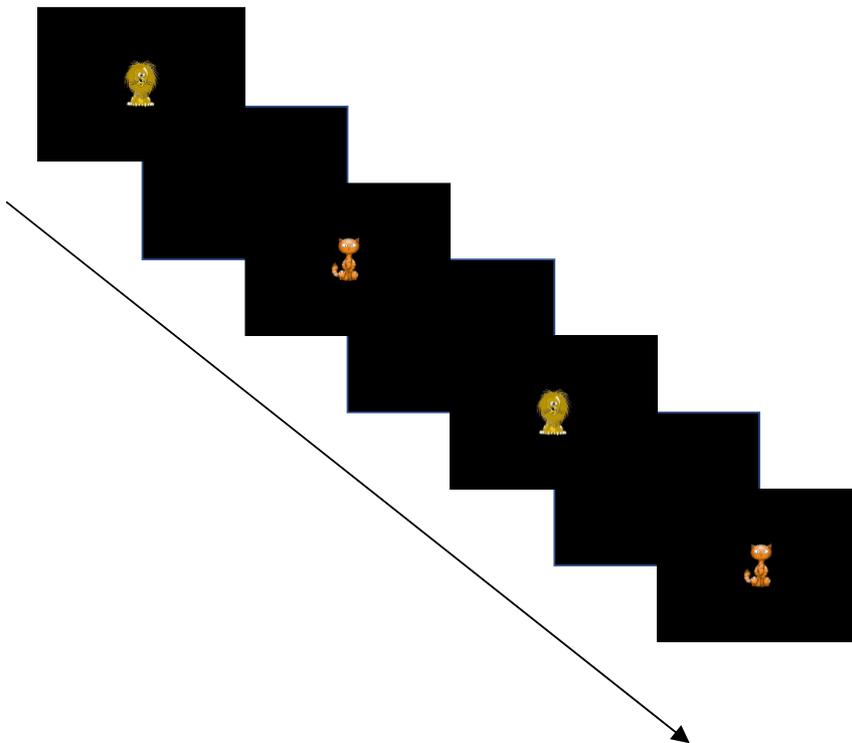
Trail Making Test (Reitan, 1971). This test has two parts. In Trail A, children are asked to draw lines connecting numbers by numerical order without lifting the pencil (numbers from 1-25 are distributed randomly across the test-sheet). In Trail B, the test-sheet contains numbers from 1-12 and letters from A-L; however, children have to connect numbers and letters by alternating the sequence, i.e., 1-A-2-B-3-C, etc. The score is the amount of time required to complete each trail.

Gender-Smile switch task (adapted from Huizinga, Dolan, & van der Molen, 2006). In this task the stimuli are schematic faces (male or female, happy or sad), appearing in a 2×2 grid. At each test, a stimulus is presented in the center of one of the four quadrants (5×5 cm). At the beginning of the task (homogeneous condition), the children must answer regarding gender (block A), if the face was presented in one of the two upper quadrants; or the emotion of the face (block B), if it was presented in one of the two lower quadrants (blocks A and B, are presented in random order). In the third block (heterogeneous condition), the stimuli moves clockwise through the grid and children must respond regarding the gender, when the face appears in one of the two upper quadrants, or to the expression of the face, when it appears in one of the two lower quadrants. As stimuli move clockwise on the heterogeneous condition, switching trials are predictable. All trials are presented for a duration of 3500 ms, with an inter-trial interval (900-1100 ms). The task contains 152 trials (80 homogeneous condition / 72 heterogeneous condition).



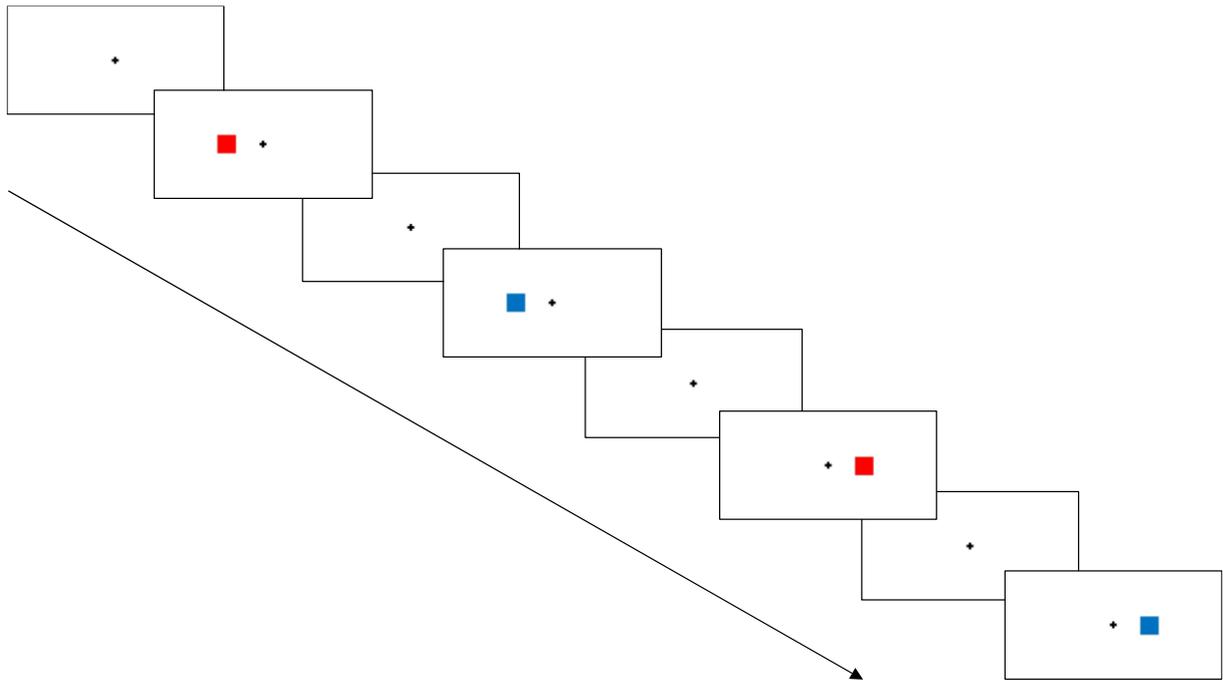
Supplemental Figure 2

Illustration of the modified flanker task



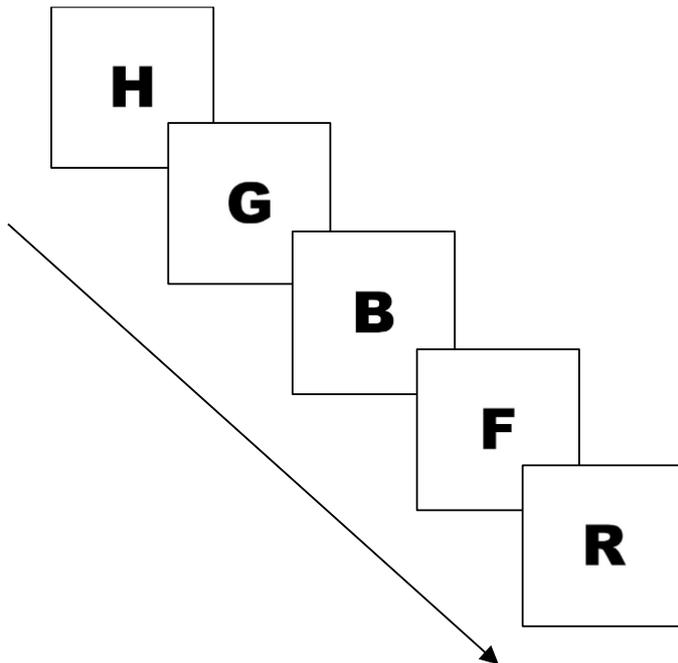
Supplemental Figure 1

Illustration of the Go/No-Go task



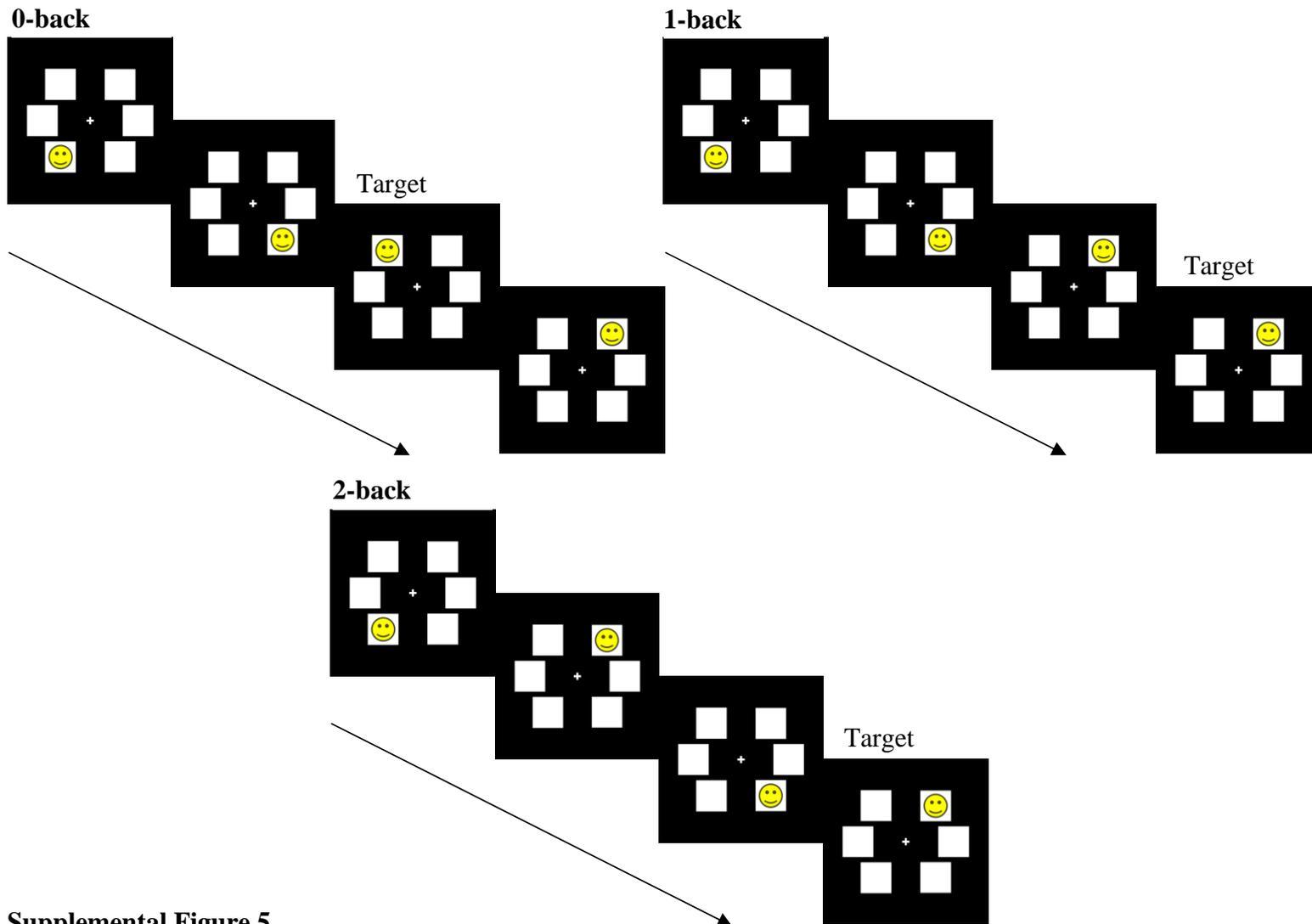
Supplemental Figure 3

Illustration of the Simon task



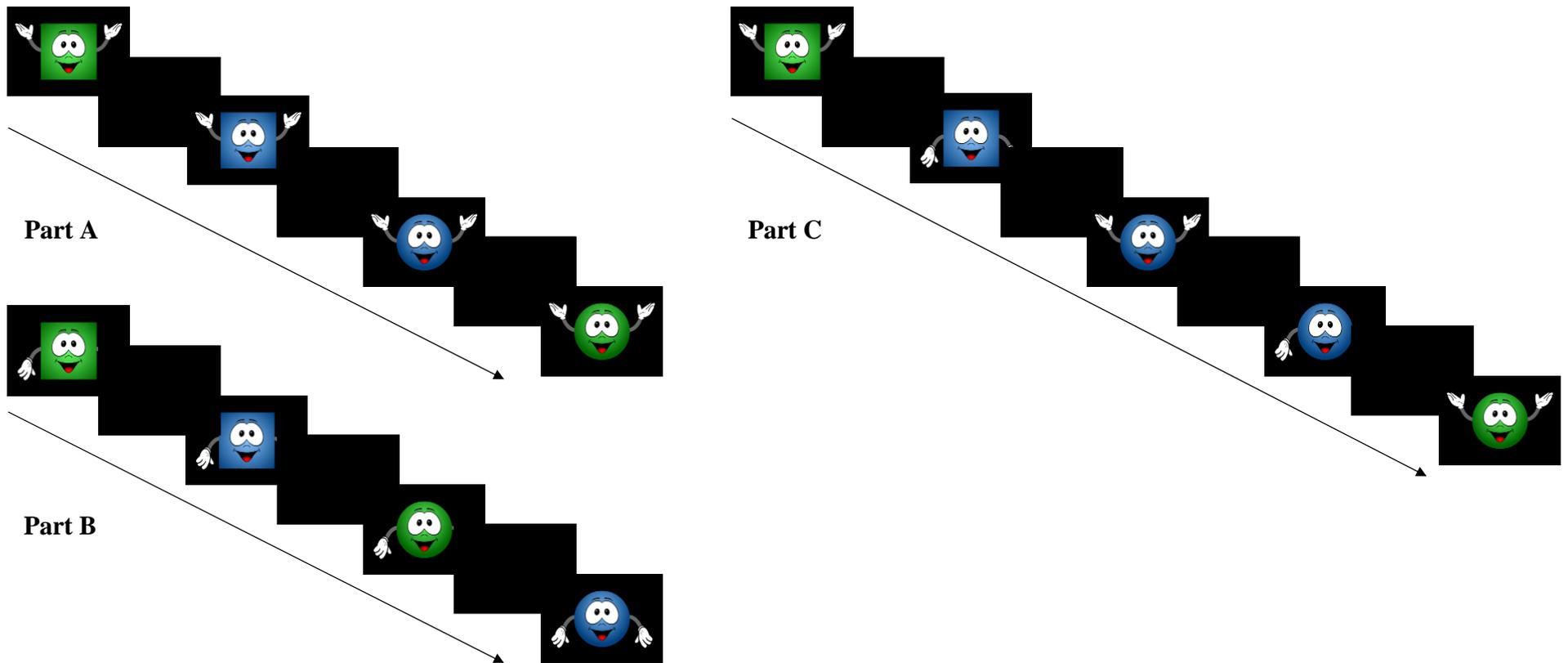
Supplemental Figure 4

Illustration of the Letter-memory task



Supplemental Figure 5

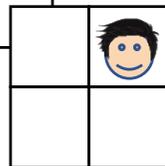
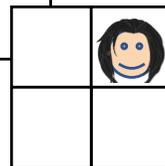
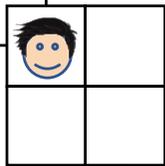
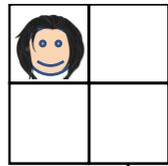
Illustration of the Spatial n-back task



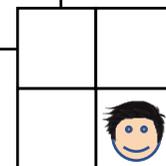
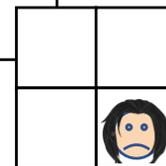
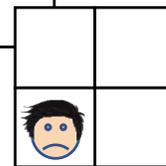
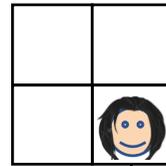
Supplemental Figure 5

Illustration of the color-shape switch task. Participants completed 2 blocks of the homogeneous condition (A, one block responding to the shape; B, one block responding to the color), then completed 3 blocks of the heterogeneous condition (C, arms down indicate respond to color, arms up indicate respond to shape).

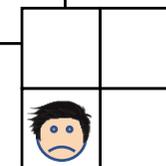
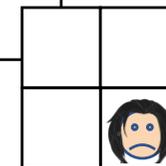
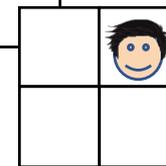
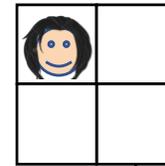
Part A



Part B



Part C



Supplemental Figure 6

Illustration of the Gender-Smile switch task. Participants completed 2 blocks of the homogeneous condition (A, one block responding to the gender; B, one block responding to the emotion), then completed 3 blocks of the heterogeneous condition (C, upper quadrants indicate respond to gender, lower quadrants indicate respond to emotion).