**Supplemental Material**

Executive Functioning Correlates of *DSM-5* Maladaptive Personality Traits: Initial Evidence from an Italian Sample of Consecutively Admitted Adult Outpatients

**Measures**

*PEBL Wisconsin (Berg’s) Card Sorting Test (WCST; Piper et al., 2012)*. WCST is classic test of executive functioning. Participants were provided two decks of cards on computer screen and asked to match each card, one at a time, to one of four key cards, after which they received feedback from the computer program (i.e., correct or incorrect). Test cards can be matched to the key cards based on “color” (red, green, blue, or yellow), “form” (triangle, star, cross, or circle), and/or “number” (1, 2, 3, or 4 shapes on the card), with some cards matching the key cards based on multiple sorting principles (i.e., a test card depicting two green circles would match a key card depicting two green triangles based on both the number and color principles). However, only one of these sorting principles is correct at any given time and the correct sorting principle changes each time the participant achieves 10 consecutive correct responses (i.e., one completed category). The correct sorting principle is initially unknown to the participant and is never explicitly stated by the examiner during the test. The participant is instructed that the experimenter cannot tell him or her *how* to match the cards, but the computer program will indicate after each trial whether the participant’s card placement was correct or incorrect. Participants are expected to utilize this feedback to learn the correct sorting principle to accurately advance through the test. In the present study, after each trial, feedback of “correct!” or “incorrect” was displayed for 500 ms.; the maximum number of trials was 128 (i.e., two decks of 64 cards).

*Continuous Performance Test (CPT; Conners et al., 2003; Piper, 2012)*. Each participant completed a practice session until the examiner was confident that the participant understood the task completely. The task consisted of 360 letters (approximately 1 in. in size) which appeared on the computer screen, one at a time, for approximately 250 ms. The 360 trials were presented in 18 consecutive blocks of 20 trials. The 18 inter-stimulus intervals (ISI) blocks consisted of a separate ISI (1, 2, or 4 s). The ISIs were block-randomized so that all three ISI conditions would occur every three blocks but in a different order. Therefore, the entire CPT could be divided into six consecutive time blocks with each time block containing all three ISI conditions. Participants were required to depress the spacebar when any letter except the letter “X” appeared on the screen. The event rate, or percentage of trials when letters other than “X” appeared, was 90% and this percentage was constant across ISI and time blocks. The total CPT task takes approximately 14 min for the patient to complete.

The CPT generates multiple dependent measures including RT to correct responses (hit reaction time or hit RT), standard error (SE) of hit RT, percentage of commissions, percentage of omissions, and the signal detection parameters, *d’* and *β*. Errors of omission occurred when subjects failed to depress the spacebar on trials containing target letters (all non-“X” letters). Errors of commission occurred when subjects depressed the spacebar on trials when the letter “X” was presented. The *d’* reflects the subject’s perceptual sensitivity to targets; it is the distance between the signal distribution and noise distribution in standard score units. Higher *d’* values indicate higher amounts of signal detection relative to noise and suggests better discrimination between target and foil stimuli. Rather, *β* can be intuitively understood by noting that in a task in which there are 90% targets and 10% nontargets, the subject should be responding (optimally) 90% of the time. More responding than this will increase errors of commission. Less responding than this will increase errors of omission. Thus, *β* is a function of the ratio of target to nontarget stimuli and the subject’s tendency to respond too little or too much relative to the actual distribution of the signal. Lower values of *β* indicate a greater percentage of responding than is required by the task parameters or a “risky” response style.

The CPT was shown to have adequate split-half and three-month test-retest reliability (Conners, 2003), and efficiently discriminated ADHD participant groups from non-ADHD controls (Seidel & Joschko, 1990). In our study, CPT indices showed adequate consistency across different ISIs (median intraclass *r* value = .79, *SD* = 14) and blocks (median intraclass *r* value = .77, *SD* = .01).

*Go/NoGo task (Bezdjian et al., 2009)*. The Go/NoGo task is a response inhibition task where a motor response must either be executed or inhibited. During this task, participants were required to watch a sequential presentation of letters and respond to a target letter by pressing a button. The presentation began with a 2 x 2 array with four stars (one in each square of the array). A single letter (P or R) was then presented in one of the squares for a duration of 500 milliseconds with an ISI of 1,500 ms. In the first condition (P-Go), participants were asked to press a button in response to the target letter P and withhold their response to the non-target letter R. The ratio of targets to non-targets was 80:20. The first condition consisted of 160 trials.

A second, reversal condition (R-Go) was then administered, and participants were now asked to make a response to the target letter R and withhold their response to the non-target letter P (the letter that they were initially conditioned to make a motor response to in the first, P-Go condition). The ratio of targets to non-targets stays exactly the same during the reversal (R-Go) condition (ratio of targets to non-targets-80:20). Together, the two conditions consisted of 320 trials total. Prior to the task, the participants were administered a brief practice session to ensure the task was fully comprehended. Behavioral performance of the task was assessed by calculating four values in each condition: 1) correct responses to the target (Go) letter (hits); 2) errors of omission (misses) to the Go letter; 3) errors of commission (false alarms) (i.e. responding incorrectly to the NoGo letter); and 4) correct rejections to the NoGo letter. In addition, reaction time (RT) and RT variability to the Go letter was assessed and calculated for each participant. Go errors are typically considered as an indicator of inattention to the task, while NoGo errors and RT to Go responses are considered as indicators of impulsivity (Barkley, 1991; Halperin et al., 1991).

*Victoria Stroop Interference Task (VSIT; Troyer et al., 2006)*. VSIT stimuli include three cards, each of which contains six rows of four items. Within each row, one item is presented in each of the following colors: red, blue, yellow, and green. On each of the three tasks, participants are asked to scan the items across rows from left to right and to identify the color of each item as quickly and accurately as possible. On the first task, the Dot task, items are colored dots. On the second task, the Neutral Word task, the items are common words (i.e., when, hard, and, over) presented in color on computer screen. On the third and final task, the Color Word task, the items are color names (i.e., red, blue, yellow, green) presented on computer screen in colors not corresponding to the words themselves.

Different from standard paper-and-pencil administration of the VSIT (Spreen & Strauss, 1998), in computer-administered VSIT interference effect is determined by calculating the extra time required to name colors in the interference task in comparison to the time required to name colors in the control task.

*Tower of London (ToL; Anderson et al., 2012; Piper et al., 2012)*. ToL is a test of planning in which colored disks or balls on pegs are moved individually from an initial state to match a goal state. Optimal performance involves forming, retaining, and implementing a plan to make as few moves as possible. This test was originally developed as a simplified version of the Tower of Hanoi by Shallice (1982). The cognitive and neurophysiological substrates of ToL performance have been frequently and thoroughly examined (Phillips, Wynn, Gilhooly, Della Sala, & Logie, 1999; Ward & Allport, 1997). Both lesion and neuroimaging findings have identified the prefrontal cortex as integral in performing the ToL, as well as the TMT and WCST (Davidson et al., 2008; Schall et al., 2003; Zakzanis, Mraz, & Graham, 2005).

In PEBL ToL task, participants are instructed that they can move only one disk at a time, and they cannot move a disk onto a pile that has no more room (indicated by the size of the grey rectangle). To move a disk, participants have to click on the pile they want to move a disk off of, and it will move up into the hand. Then, they have to click on another pile, and the disk will move down to that pile. PEBL ToL placed no restrictions on the height of the pegs or the number of moves allowed to solve the problem. The primary index of PEBL ToL was the total number of extra moves across the seven trials (moves made minus 48, the minimum necessary to solve the problems), although the total time was also recorded.

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Table 1a.

*Personality Inventory for DSM-5 Domain and Trait Scales: Descriptive Statistics Broken Down by DSM-IV/DSM-5 Section II Personality Disorders Cluster (N = 53).*

|  |  |  |  |
| --- | --- | --- | --- |
|  | Cluster A (*N* = 7) | Cluster B (*N* = 17) | Cluster C (*N* = 7) |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Personality Inventory for *DSM-5*** | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| Anxiousness | 1.89 a | 0.51 | 1.80 a | 0.86 | 1.89 a | 0.51 |
| Emotional lability | 1.90 a | 0.56 | 2.01 a | 0.63 | 1.90 a | 0.56 |
| Hostility | 0.90 | 0.40 | 1.55 a | 0.73 | 0.90 | 0.40 |
| Perseveration | 1.35 | 0.78 | 1.48 a | 0.64 | 1.35 | 0.78 |
| Restricted affectivity | 1.16 | 0.69 | 1.14 a | 0.53 | 1.16 | 0.69 |
| Separation insecurity | 1.63 a | 0.54 | 1.36 a | 0.81 | 1.63 a | 0.54 |
| Submissiveness | 1.39 a | 0.88 | 1.28 a | 0.79 | 1.39 a | 0.88 |
| **Negative Affectivity** | 1.56 a | 0.32 | 1.62 a | 0.45 | 1.56 a | 0.32 |
| Anhedonia | 1.61 a | 0.68 | 1.83 a | 0.75 | 1.61 a | 0.68 |
| Depressivity | 1.36 a | 0.59 | 1.76 a | 0.80 | 1.36 a | 0.59 |
| Intimacy avoidance | 0.67 | 0.67 | 0.95 | 0.88 | 0.67 | 0.67 |
| Suspiciousness | 1.21 | 0.69 | 1.08 | 0.65 | 1.21 | 0.69 |
| Withdrawal | 1.27 a | 0.69 | 1.34 a | 0.84 | 1.27 a | 0.69 |
| **Detachment** | 1.18 | 0.55 | 1.35 a | 0.59 | 1.18 a | 0.55 |
| Attention seeking | 1.01 | 0.87 | 1.44 a | 0.86 | 1.01 | 0.87 |
| Callousness | 0.27 | 0.39 | 0.93 a | 0.53 | 0.27 | 0.39 |
| Deceitfulness | 0.41 b | 0.29 | 0.92 a | 0.63 | 0.41 a | 0.29 |
| Grandiosity | 0.46 | 0.51 | 0.98 a | 0.69 | 0.46 | 0.51 |
| Manipulativeness | 0.40 | 0.35 | 0.89 | 0.69 | 0.40 | 0.35 |
| **Antagonism** | 0.52 | 0.42 | 1.03 a | 0.51 | 0.52 | 0.42 |
| Distractibility | 0.93 | 0.41 | 1.32 a | 0.65 | 0.93 | 0.41 |
| Impulsivity | 0.71 b | 0.44 | 1.47 a | 0.70 | 0.70 b | 0.44 |
| (lack of) Rigid perfectionism | 1.48 | 1.10 | 1.47 | 0.83 | 1.48 | 1.10 |
| Risk taking | 0.97 | 0.53 | 1.51 a | 0.53 | 0.97 | 0.53 |
| Irresponsibility | 0.71 | 0.65 | 1.27 a | 0.63 | 0.71 | 0.65 |
| **Disinhibition** | 0.97 | 0.25 | 1.44 a | 0.36 | 0.97 | 0.25 |
| Eccentricity | 1.00 | 0.62 | 1.29 a | 0.67 | 1.00 | 0.62 |
| Cognitive dysregulation | 0.73 | 0.73 | 0.72 | 0.62 | 0.73 | 0.73 |
| Unusual beliefs | 0.65 | 0.97 | 0.78 | 0.58 | 0.65 | 0.97 |
| **Psychoticism** | 0.70 | 0.66 | 0.86 a | 0.44 | 0.70 | 0.66 |

*Note*. a: mean score significantly (i.e., one-tailed *p* <.05) larger than corresponding PID-5 scale mean score in Italian adult normative sample (*N* = 1544)

b: mean score significantly (i.e., one-tailed *p* <.05) lower than corresponding PID-5 scale mean score in Italian adult normative sample (*N* = 1544)