Section A: Measures

Interviews

The Yale Brown Obsessive Compulsive Scale-Revised (YBOCS-R). This scale was administered to assess severity of symptoms and screen for participants that fit the mild to moderate OCD symptom severity range, which has been defined as $5 \geq 32$ [1]. The YBOCS-R has been consistently used within OCD literature to measure disorder severity, with half of the questions related to obsessions and the other half related to compulsions [2]. The interview version of this scale was administered during initial phone screening to ensure participants were experiencing mild to moderate symptoms of OCD and was repeated again when participants attended the testing session.

The Mini-International Neuropsychiatric Interview (MINI). The MINI [3] is a diagnostic tool for DSM-IV disorders and was used to assess the presence of any psychiatric disorders. The MINI includes screening questions for each disorder and, if the screening criteria for the disorder is met, additional symptom questions follow. The MINI has been commonly used in psychiatric research due to the interview's timely nature (average of 21 minutes), high sensitivity and selectivity, clinical relevance and good validity and reliability [3].

Questionnaires

Compulsivity. Compulsivity was indicated by the composite score of The Obsessional Beliefs Questionnaire and The Intolerance of Uncertainty Scale. This is based on prior literature conceptualising the domains of compulsivity [4].

The Obsessional Beliefs Questionnaire (OBQ-44). The OBQ-44 [5] was used to measure the level of obsessional beliefs experienced by participants, with higher scores indicating higher severity. The OBQ-44 uses a 7-point, self-report Likert scale (1- disagree

very much to 7 – agree very much) to measure 3 domains: (1) Importance and Control of Thoughts; (2) Perfectionism and Intolerance of Uncertainty; (3) Responsibility and Threat Estimation. All subscales of the OBQ have good internal reliability across individuals diagnosed with OCD (alpha coefficient = 0.84 - 0.93), and non-clinical samples (alpha coefficient = .86 - .93), and psychometric analysis of the OBQ has shown that it is a valid measure of OCD-related thinking [6].

The Intolerance of Uncertainty Scale – Short Form (IUS). The IUS [7] was used to assess the level of uncertainty that can be tolerated by participants, with higher scores indicating lower tolerance. The IUS uses a 5-point, 12 item, self-report Likert scale (1- not at all characteristic of me to 5- entirely characteristic of me) to measure 2 domains of beliefs related to the consequences of uncertainty: (1) Desire for Predictability and an Active Engagement in Seeking Certainty, and (2) Paralysis of Cognition and Action in the Face of Uncertainty. The IUS has shown excellent internal reliability and divergent validity with anxiety symptoms [8], in particular it is significantly associated with self-reported OCD symptoms [9].

Impulsivity. Impulsivity was indicated by The Short Version of the Urgency, Premeditation, Perseverance, Sensation Seeking and Positive Urgency, Impulsive behaviour scale.

The Short Version of the Urgency, Premeditation (UPPSS-P). The UPPSS-P [10] was used as a measure of impulsivity, with higher scores indicating greater impulsivity. The UPPSS-P uses a 4-point, 20 item, self-report Likert scale (1=agree strongly to 4=disagree strongly) to conceptualise individuals across 5 domains of impulsivity: (1) Negative Urgency: the impulsivity experienced when responding to negative affect; (2) Sensation Seeking: the sensitivity to rewards and tendency to seek excitement, (3) Lack of Premeditation: the tendency to act without thought; (4) Lack of Perseverance: the inability focus on and complete a task may be tedious; (5) Positive Urgency: the impulsivity experienced when

responding to positive affect. The short version of the UPPSS-P is accepted as reliable alternative to the original UPPS-P in non-clinical, English speaking samples [10].

Cognitive tasks

The Stop-Signal task (SST). The SST [11] is a measure of the ability to inhibit an initiated response, thus participants completed the task whilst ERPs were recorded, and it was also used as a behavioural measure of inhibitory control. This study used a gold-standard SST that has previously elicited the inhibitory control ERPs of interest (N200 and P300) [12]. Participants were instructed to respond when they saw a left/right directed white arrow with the corresponding left/right keyboard button and, withhold a response when they saw a red arrow. Participants were asked specifically to respond as fast as possible. A fixation cross was presented on the monitor screen, followed by a presentation of the target 'Go' stimuli indicated by a white arrow, which required a response. However, on 33% of the trials, the 'Go' stimuli was soon followed by the 'Stop' stimuli indicated by a red arrow, which required participants to withhold a response. The SST is based on the horse race model, which suggests that the process involved in responding is independent from the process involved in inhibiting a response. Thus, if the process involved in inhibitory control is completed before the process responsible for a response, it is likely that inhibitory control will be successful. Based on this model, the longer the stop signal delay (SSD; the time between the 'Go' and 'Stop' stimuli), the more difficult it is for participants to engage in successful inhibitory control as the responding process begins earlier than the inhibitory control process as the delay increases. Thus, the SDD was adjusted by 50ms increments (starting at 200ms) to ensure adaptive difficulty and an accuracy rate of 50% for all participants. The durations of the task components were fixation cross: 500ms; response deadline/presentation of 'Go' stimuli: 1000ms; presentation of stop stimuli: 100ms; total duration per trial: 3000ms.

The specific behavioural metric collected from the SST was the Stop Signal Reaction Time (SSRT). This is the time required for a person to stop a response, and gives an indication of the inhibitory control latency, i.e., how long it takes for someone to inhibit a response. SSRT was calculated based on the integration method [11,13].

Section B: EEG Analysis

Calculating P3: COMPASS Algorithm

Selecting these components included the following steps based the COMPASS algorithm used in Wessel, Aron [12] for each participant's failed and successful trial. The steps included:

1. Topography and visual inspection: Topographical representation of a given component had to have a local maximum at frontocentral scalp electrodes (Fz and Cz). Additionally, to be selected for further analysis these components also had to show clear positive peaks in the 300 to 500 ms time window.

2. Corelation with back projected EEG: Of those components selected at step 1, the component chosen for further analysis was that which showed the highest Pearson's corelation between the back-projected time course of the given component averaged across the frontocentral electrodes and the original channel ERPs.

3. Of the trials that met the above criterion, the amplitudes and latencies for Failed and Successful Stop trials were then calculated on the back projected ERPs based on a statistical comparison with matching Go trials. The P3 *onset* latency was calculated as the earliest point at which a significant difference between a stop trial and matching go trials emerged. This statistical comparison was made using a Monte Carlo permutation tests. P values were corrected for multiple comparisons

using the FDR procedure to a familywise error rate of $p < .05$ (one-sided). P3

amplitudes were calculated based on local maximums relative to the baseline.

Calculating N2: COMPASS Algorithm

Only those ICA components which best represented the N2 ERP were included in further

analysis. Those ICA components which did not reflect N2 ERP waveforms were removed

from further analysis. Components were selected based on:

1. Topography. Components were selected to include in further analysis where a

   topographic negativity is evident in frontocentral channels over a time window of

   180ms to 300 ms post Go target onset.

2. Visual inspection. Selected components must also show clear negative going

   deflection relative to baseline in the ERP time series over time window of 180 ms

   to 300 ms post Go target onset. The selection of the temporal window for N2 ERP

   analysis was based on previously established parameters [14].

Baseline averages were removed from both all trials. This baseline was calculated

from 100 ms prior to the Go signal onset. Drawing on previously established protocols [14], the

N2 amplitude was then defined as the most negative deflection in the ERP within a time

window of 180 ms to 300 ms post target onset. Ultimately, of the 40 data sets, within the

failed and successful stop trials, 37 were included as satisfying each of the above steps for

N2.

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