COGNITIVE CONTROL IN HIGH AND LOW SUGGESTIBLE INDIVIDUALS

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Masters by Research

July 2023

Abstract

The current work aimed to investigate cognitive control use in high and low hypnotically suggestible individuals in the context of the Dual-Mechanisms of Control Framework (Braver, 2012), to determine whether the differences in suggestion response are explained by the type of cognitive control individuals employ. The first experimental chapter set out to compare effortful, proactive control use in both medium-high and low-medium suggestible individuals, both under suggestion and at baseline, using the word-blindness suggestion to modify Stroop task performance. An eye-tracker was used to measure pupil size as an indicator of effortful control use (Parris et al., 2021). The findings replicated the word blindness suggestion effect in the RT data but did not differ between medium-highs and low-mediums. Furthermore, contrary to Parris et al. no increase in effort was observed between the two groups in response to suggestion, indicating effort was not responsible for this effect. The second experimental chapter aimed to investigate cognitive control outside of the hypnotic context, to test control use as a predictor for suggestibility, involuntariness and effortlessness. The task consisted of three blocks of trials (List-Wise mostly incongruent, List-Wise mostly congruent and Item-Specific Proportion Congruency) in order to test proactive and reactive control use and their relationship to the three dependent variables. The regression analysis failed to show any relationship between control use and suggestibility, involuntariness or effortlessness.

Preface and acknowledgement

I completed this MRes to further my skills in the research field in order to pursue a career within psychology and clinical-based research. I believe research is key to enable the development and understanding of key issues and practical implementations in order to help society and the community in which we live in.

I would like to thank my supervisors, Professor Dr Ben Parris and Dr Shanti Shanker for their continued support and assistance during my studies along with my close family and friends for their ongoing encouragement during the past year.

I would also like to thank Bournemouth University for the Scholarship I received towards my MRes which enabled me to fund this project.

Declaration

I declare this work is my own and that I have adhered to BU’s rules and regulations.

Cognitive control in high and low suggestible Individuals

Introduction

Suggestion is an idea or belief communicated that, when accepted, can lead to a change in an individual's thoughts, feelings, perceptions and behaviour (Halligan & Oakley, 2014). Suggestibility is often based on the individual's likelihood of accepting these suggestions. Hypnotic suggestibility is measured as suggestion following hypnotic induction (Kirsch, 1996) and has become increasingly of interest within the literature, with clinical applications of hypnosis used to effectively reduce symptoms such as depression and stress (Alladin, 2010; Oakley & Halligan, 2013), especially with the development of self-hypnosis techniques which can be used within the workplace (Laidlaw et al., 2003). Further, hypnosis has also been shown as a useful tool for pain management and can have powerful effects in reducing symptoms of chronic pain (Elkins et al., 2012) and understanding the role of suggestibility is worth investigating.

Experiences of hypnosis usually vary, with 15-20% of the population being highly suggestible to hypnosis (Highs) and another approximately 20% being low in suggestibility (Lows; Lynn et al., 2020). The experiences of certain suggestions may differ depending on the nature of the suggestions (McConkey et al., 1999) with the level of suggestion-involuntariness greater for some individuals than others (Terhune et al., 2011b). Although highs and mediums may not differ for a particular suggestion, highs were found to experience suggestions more than lows for all items such as arm rigidity, levitation and anosmia (McConkey et al., 1999). These differences in

hypnotic experiences are still not fully understood and is still a current topic investigated within the literature.

‘The classic suggestion effect’ is a phenomenon which is observed following hypnotic suggestions where responses are experienced as being involuntary (Bowers, 1982; Weitzenhoffer, 1974). Reasons for this are still unclear, with current literature exploring the type of cognitive control employed in response to hypnotic suggestions such as the word blindness suggestion effect (WBSE) on Stroop task performance as reported in Parris et al., (2012, 2021). Investigating the type of cognitive control employed by highs and lows may be key in order to further understand why this “classic suggestion effect” occurs and may be an important factor when accounting for the effectiveness and individual experiences of hypnosis. Cognitive control differences between high and low suggestible individuals might be a potential contributing factor and explanation of differences in experienced involuntariness and effortlessness following hypnotic suggestions and why some may experience certain suggestions stronger than others (Terhune et al., 2011b).

The Dual Mechanism of Control (DMC) framework, a recent and powerful framework for understanding variability in cognitive control, distinguishes between proactive and reactive control (Braver, 2012). Proactive control involves the preparation and maintenance of attention in order to carry out goal-related behaviour (Diede & Bugg, 2017). This, however, can use a lot of attentional resources and can have high metabolic costs because it is stimulus-independent (Goschke, 2003) and is reliant on expectations and anticipation (Braver, 2012). In contrast, reactive control is activated, or triggered, in response to a cue or stimulus and may seem effortless. Here goal representations are only activated in response to the relevant stimulus and

therefore is deemed as efficient (Braver, 2012). An important distinguishing factor between the two control modes is the effort required to enact control, with proactive control being reliant on attention to the primary goal and contextual cues, whereas reactive control is stimulus but not context-dependent (Goschke, 2003).

Theories of Hypnosis

The DMC is closely related to an earlier theory of cognitive control. The Supervisory Attentional System (SAS; Norman & Shallice, 1986) model proposed a key executive control mechanism called the Supervisory Attentional System whose role is to select schemas (action plans in novel contexts). Notably, the SAS distinguished between this effortful, voluntary form of control and a more automatic mechanism of control. Contention scheduling, as this automatic system, is perceived as the process of selection of routine action. Moreover, where potential schemas compete when more than one schema is activated automatically by context and therefore, more than one is in contention for activation, this scheduling mechanism selects a schema based on its activation value exceeding a given threshold (Norman & Shallice, 1986). Proactive control is somewhat akin to the SAS, whereas reactive control is somewhat akin to contention scheduling. Importantly for present purposes, the SAS was one of the original models of cognitive control used to account for hypnotic responding.

Models of control under hypnosis

Woody and Bowers (1994) argued that hypnosis disrupts the SAS. Once the SAS is disabled, behaviour is controlled solely by contention scheduling which gives rise to experiences of involuntariness (since the SAS is the mechanism for voluntary control). Given the similarity between the effortful and more voluntary proactive

control and the SAS, a direct prediction is that the hypnosis and hypnotic responding is related to proactive control use.

Another model of hypnotic responding, allies hypnotic responding with something more akin to reactive control. Response Set Theory (Kirsch & Lynn, 1997) suggests that most of what we do is unplanned, automatic, and primed by our environment (Hassin et al., 2005). Response to suggestions appears to be triggered effortlessly and automatically which reduces the need for action control due to cognitive and behavioural schemas preparing for automatic activation (Kirsch & Lynn, 1997). This may indicate a more reactive control mechanism employed under hypnotic suggestions due to automatic responses triggered by the suggestion given. It has also been theorised that hypnotic suggestibility may be a consequence of a stable trait in which there is a preference to employ reactive control mechanisms (Braver, 2012) and may also explain why responding to suggestions may seem involuntary and stimulus-driven. This could suggest that an individual's preference for reactive control may be a potential reason for some individuals experiencing higher involuntariness than others (Terhune et al., 2011b).

Implementation intentions are specific plans in which individuals will decide when, where and how actions will be used for goal-directed behaviours, often using an if-then model (Gollwitzer, 1999). Responding to hypnotic suggestions has previously been described as implementation intentions (Kirsch & Lynn, 1997) due to the automaticity and "classic suggestion effect" which is perceived too often occur. Implementation intentions may be similar to reactive control due to event-triggered behaviour which requires little effort in maintaining an action plan between the creation and implementation of it. Implementation intentions have been linked to

reactive control, with implementation intentions increasing hypnotic suggestibility (Schweiger et al., 2012), however, implementation intentions did not create this effect alone, but only after a hypnotic induction procedure. There seems to be good reason therefore to associate hypnotic responding with reactive control. Indeed, taken together the above theories propose that highly hypnotically suggestibility is associated with poorer proactive control and a greater reliance on reactive control.

However, in contrast to the above, the motivation account indicates the importance of motivation in hypnotic responding (Spanos & Barber, 1974). It is suggested that hypnotic responses require motivation to act towards the suggested goal and requires good attention to the hypnotic scenario and additionally, their willingness to cooperate with the given suggestions (Spanos & Barber, 1974). This idea of motivation being an important element may also be backed up by the findings from Parris et al., (2021), where pupil size, which is putatively a measure of increased effort (Laeng et al., 2011) was found to be greater following suggestions than at baseline, which may be due to increased motivation. This also suggests greater proactive control employment when responding to hypnotic suggestions.

Proactive control has been suggested to be linked with expectations and anticipation (Braver, 2012), with experimental studies showing that expectation for high interference in probe tasks tends to increase proactive control use (Burgess & Braver, 2010), as opposed to low expectancy, exhibiting increased reactive control (Braver, 2012). Expectations have also been shown to play a role in hypnotic responding (Kirsch and Lynn, 1995), again indicating a relationship between increased proactive control and hypnotic responding. Expectation, however, may not necessarily be a direct link to hypnotic responsiveness and may not be related to

experiences of involuntariness (Dienes & Perner, 2007), although they may be key in understanding the cognitive mechanisms individuals employ which could consequently affect the involuntariness individuals experience.

In the following experiments, the extent to which proactive and reactive control is linked to hypnotic responding will be explored. In the first Experimental chapter, pupil size will be used as a measure of proactive effortful control whilst participants respond to a post-hypnotic suggestion. In the second Experimental chapter, independent measures of proactive and reactive control will be used as predictors of hypnotic responding.

Experiment 1: Cognitive control employed following a post-hypnotic suggestion

The Stroop task (Raz et al., 2002), is a computer-based task with three levels of congruency. During the task, participants are asked to respond to the colour of congruent (e.g., blue written in blue), incongruent (e.g., Blue written in red) and neutral words. Interference (incongruent Reaction Times (RTs) – Neutral RTs) evidences slower reaction times to incongruent trials (Bugg et al., 2008) and multiple levels of control may be used during trials. The Word Blindness Suggestion effect (WBSE) is a phenomenon in which participants are asked to undergo the Stroop task, but are given the suggestion that words will appear as if they are meaningless symbols and will therefore find the task easy and effortless. This manipulation has been shown to reduce Stroop interference in highly suggestible individuals (Raz & Campbell; Parris & Dienes, 2013).

The Word-Blindness suggestion (Parris et al., 2012), has been used to test the type of cognitive control employed under (post)hypnotic suggestions. For example, Parris et al., (2012), tested whether hypnotic suggestions employed proactive or reactive control with 19 highly suggestible participants. Participants completed a Stroop task, consisting of congruent, incongruent, and neutral trials and were counterbalanced between the suggestion and control conditions. Participants showed a significant reduction in Stroop interference following the word-blindness suggestion, which was only found during short Response Stimulus Intervals (RSIs). The findings suggested that the WBSE, was present at short RSIs (500ms) for all trials, but absent at long RSIs (3500ms), which may suggest that responding to the word-blindness suggestion may be in fact a reactive control mechanism due to response to the

presence of the stimulus. In a further study testing highs and lows in response to the Word-Blindness suggestion, highs showed a greater reduction in Stroop interference during the suggestion condition as opposed to low suggestible individuals (Parris & Dienes, 2013). This was in line with and backed up past findings (Raz & Campbell, 2011). However, in contrary to Parris et al., (2012), no effect on RSI's was found in another study employing the WBSE (Parris & Dienes, 2013). This could be due to participants eliciting better proactive control than those in Parris et al., (2012).

Landry et al., (2022) also examined the Word Blindness phenomena, in line with the DMC, suggesting a proactive view, in response to hypnotic suggestions, or more specifically the Word Blindness suggestion using the classic Stroop task with congruent, incongruent, and neutral stimuli. Participants were of both high and low suggestibility and were from past studies from Raz et al., (2002; 2005). The assumption that a reduction in congruency for early quantiles would indicate proactive control use was used as a measure of control during the WBSE. Before the task, participants were given a hypnotic procedure using the Stanford Hypnotic Suggestibility Scale as well as the Word-Blindness suggestion which was activated via a clap. All participants completed both the suggestion and control conditions. It was hypothesised that, in the Stroop task, proactive control would be employed at the early stages of cognitive conflict during the WBSE and the findings supported this hypothesis. Delta plots were used to explore the time of conflict processing via quantile estimates of reaction times. It was concluded that suggestion eliminates the processing of conflict in the early or first stages of response and is related to anticipation and response expectancy and therefore that control under hypnotic responding is proactive.

Pupil diameter has been used as a measure of cognitive effort in the literature, including as a measure of proactive control use (Chiew & Braver, 2013). Findings indicate that pupil size increases during more effortful trials, therefore pupil size indicates an increase in effort (Laeng et al., 2011; Kahneman & Beatty, 1966). Parris et al., (2021), used pupil size as a measure of effort when participants completed the Stroop task both after the WBS was delivered and at baseline. They reported pupils to be larger following the suggestion than at baseline, and was interpreted as showing proactive control was used to produce the WBSE.

The present study aims to replicate that of Parris et al., (2021). However, one weakness of the study by Parris et al. was that they did not include low suggestible individuals. This leaves the possibility open that lows might also show larger pupils when given the suggestion, despite showing no effect of the suggestion on Stroop interference. In other words, pupil size might be an indicator of effort, but might not be an indicator of effect.

Method

Design

A 2 Suggestion (present and absent) X 3 Stroop conditions (congruent, incongruent, and neutral) x Group: High vs Low) within-subjects design was used to measure the type of cognitive control employed by highs and lows under the word blindness suggestion. Reaction times, accuracy and pupil sizes are dependent variables.

Participants

The a priori power analysis using G*Power to calculate sample size based on the RT effect size of the Group x Suggestion interaction effect on Stroop interference from Raz et al. (2002) with power set at 0.95, returned a sample size of 8. Similarly, an a priori power analysis using G*Power to calculate sample size based on the pupillometric effect size of the main effect of suggestion from Parris et al. (2021), with power set at 0.95, returned a sample size of 8. However, we elected to determine test sensitivity using Bayes Factors. Our original aim was to test participants from a pool of participants pre-screened on our chosen hypnotic suggestibility screening scale with a minimum of 25 participants in each group. However, data collection was substantially impacted by COVID and thus we recruited 52 unscreened participants via opportunity sampling who were given a £20 amazon voucher or two SONA credits for completion of the 2-hour study which now included screening for hypnotic suggestibility and the experiment in the same testing session. Given that previous studies have shown the WBSE in medium and high suggestible individuals (Parris et al., 2012; 2014; 2021), as indeed did the study we aimed to expand on here (Parris

et al., 2021), we used the 20 participants that scored >4 on the overall subjective score of the SWASH as the high-medium group and matched that with the 20 lowest scoring participants (they scored <2.9) for the low-medium group. This grouping allowed a reasonable separation between groups on their SWASH scores and brought us close to the originally desired group sizes.

55 participants (12 males) (Mean age= 19 Standard Deviation (SD)= 8.7) were recruited via opportunity sampling either via BU's Experiment Participant System (SONA) and granted 2 SONA credits for completion of the study, or from posters displayed around campus and given a £20 amazon voucher for completion of the 2-hour study. 40 were used in the final data set (10 Males, Mean age = 20, SD = 9.5), consisting of 20 medium-highs and 20 low-mediums.

Materials

The Sussex-waterloo scale of hypnotisability (SWASH) was used as a measure of hypnotic ability (Lush et al., 2018). This was presented via a video which presented suggestions such as arm levitation and arm righty. Participants were given a response booklet (See Appendix A) to report on their experiences during the session with both objective and subjective measures. The response booklet also included the Sense of Agency Rating Scale (SOARS; Polito et al., 2013) as a measure of effortlessness and involuntariness in response to suggestions, rated on a 7-point scale.

A second hypnotic induction was administered before participants completed the Stroop task. During this induction, which used the induction, but none of the suggestions, from the SWASH, participants received the word blindness suggestion

(As in Raz et al., 2002) which was then activated by a clap before the suggestion condition and deactivated via a double clap. Participants also completed a SOARs Questionnaire (Polito et al., 2013) after the suggestion condition as a measure of effort and involuntariness. These were rated on a scale of 1 to 7 for each item.

A manual button-press version of the Stroop task was used, which consisted of 280 trials. In each block (one baseline and one post-hypnotic suggestion) participants were required to respond to the colour of 40 congruent (Blue written in blue ink), 120 incongruent (Blue written in red ink) and 120 neutral words. There were fewer congruent trials to control for response contingency (Hasshim & Parris, 2015). The colours used were yellow (RGB: 255, 255, 0), green (RGB: 0, 200, 0) blue (RGB: 0, 0, 255), and red (RGB: 255, 0, 0), for which participants responded using the f, j, g, and h keys, respectively. The colour words used were YELLOW, GREEN, BLUE and RED and the neutral words were FLOWER, KNIFE, LOT and SHIP which were matched to the colour words for length and frequency. Words were presented on the centre of the screen and all words were printed in upper-case, bold and in size-20 Courier New font against a grey background. No word subtended an angle of >2.5°.

Each trial began with a fixation cross that was presented for 1000ms at the centre of the display. Participants had to gaze at the fixation cross for at least 300ms for the Stroop stimulus to be presented. Once triggered, the Stroop stimulus was presented for 1000ms during which time the participants could respond. After the 1000ms presentation, the Stroop stimulus was replaced by a blank screen for 1000ms. Participants were also able to respond during this period if they had not already responded. The presentation time of the Stroop stimulus was controlled at 1000ms for all stimuli so that differences in pupil diameters between Stroop conditions could

not be attributed luminance difference that result from the stimuli being on the screen for different durations (i.e., on average incongruent trials would be on the screen for longer than congruent trials if presentation duration was determined by response times). Finally, a blank screen was presented for 100ms before the next trial began.

Stimuli were presented using a standard PC running Experiment Builder software (SR Research Ltd) and displayed on a colour monitor displaying at 120 Hz. An SR Research Eyelink 1000 (SR Research Ltd) video-based pupil/CR tracker was used to record pupil size. Calibration and validation of eye movements were carried out prior to the commencement of each trial block using a 9-point calibration process. A monocular sampling rate of 1,000Hz was used. Pupil data were extracted off line using Eyelink DataViewer software (SR Research Ltd). Pupil size was measured in pixels.

Our study was designed to test for pupil size differences between the Suggestion Absent and Suggestion Present conditions in medium-high and low-medium suggestible individuals. Pupil size was continuously sampled except for when blinks occurred; when blinks did occur pupil sizes 100 ms either side of the blink were removed without interpolation and therefore did not contribute to the mean pupil size values. Pupil sizes were sampled at two phases of the task: (a) The intra-trial response phase: The average pupil size in the period 500ms before response; (b) The post-response phase: The average pupil size in the 500ms time-window from 250ms after the response was made. These phases were chosen because pupil dilations associated with effort related to Stroop task performance have been reported in pupil data both intra-trial (Hasshim & Parris, 2015) and post-response,

with post-response Stroop effects peaking around 500-600 ms after the response is made (see Hershman & Henik, 2019, 2020; Laeng et al., 2011). A 500ms pre-trial period (just before stimulus onset) acted as the pupil size baseline for both phases and was subtracted from the intra-trial and post-response phases to provide a baseline-corrected measure of performance as recommended by Mathôt et al. (2018), and used to show pupillometric Stroop effects in previous studies (Laeng et al., 2011; Parris et al., 2021). The benefit of having both intra-trial and post-response phone is that is has been argued that post-response phase might simply represent residual change due to the response that was made (Simpson, 1968).

Procedure

Participants received an information sheet and a consent form (See Appendix B) before participation within the study, followed by an opportunity to ask any questions they had before proceeding. Once any questions were answered, participants completed the consent form if they were happy to proceed.

All participants first completed the SWASH and recorded their responses in the SWASH booklets. Once the SWASH was completed, participants completed a practice version of the Stroop task consisting of 48 trials with non-lexical distractors (i.e., *****) to habituate themselves to the location of the response keys. After the Stroop practice section, participants underwent the second hypnotic induction and the word blindness suggestion was delivered. They were then immediately counted out of hypnosis. They were then sat in front of the computer screen and complete either the Suggestion Present or Suggestion Absent condition, the order of which was counterbalanced across participants. Before starting the Suggestion Present

condition, the experiment clapped once to activate the suggestion. Once finished, the experimenter clapped twice to extinguish the suggestion.

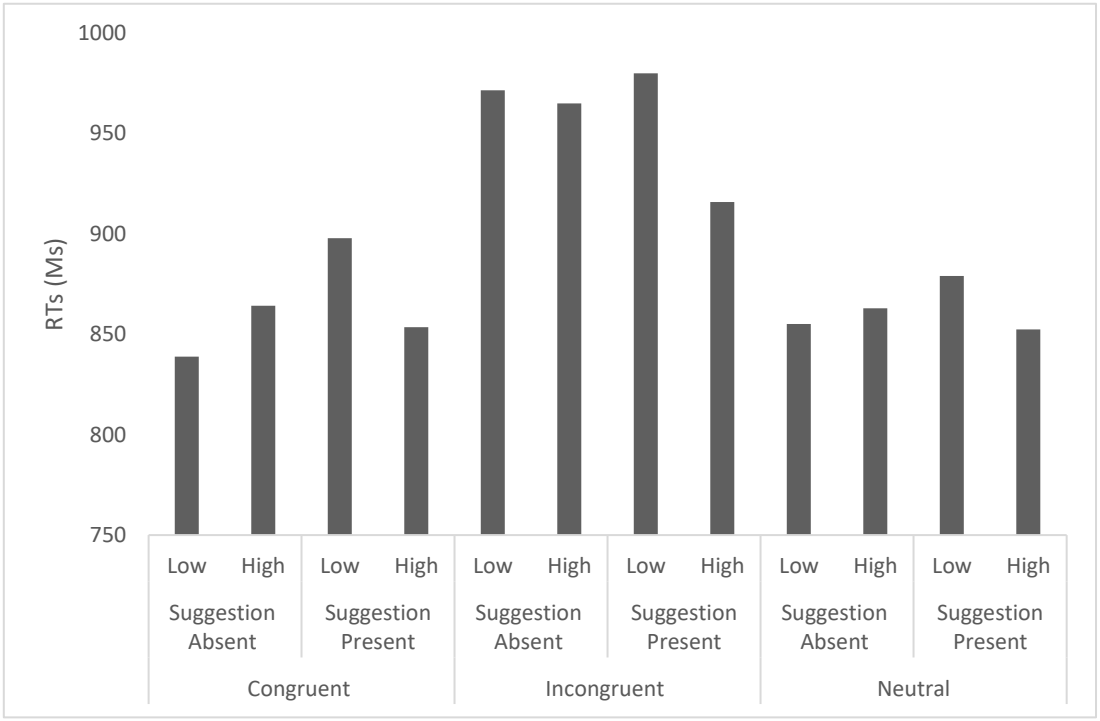
Results

A 2 (Group: Medium-high vs. Low-Medium) X2 (Suggestion: Absent vs. Present) X 3 (Stroop condition: Incongruent vs. Neutral vs. Congruent) mixed ANOVA was conducted for Reaction Times (RTs), % Errors, interatrial pupil size and post-response pupil size, investigating medium-high and low-medium suggestible individuals' response times, accuracy and effort using pupillometry during a Stroop task both under suggestion and at baseline, where group was a between subjects' factor.

For RTs, Mauchly's test of sphericity for the suggestion variable indicated that the assumptions had been met. No correction was therefore needed, however, for the Stroop condition, this had been violated $X^2(2)=8.513$ $p=.014$, therefore a Greenhouse Geisser correction was needed. Using the Greenhouse Geisser correction there was a significant within-subjects effect of RTs on Stroop condition $F(1.659, 38)=90.767$, $p<.001$, $\eta^2=.705$ but not for suggestion $F(1, 38)=.083$, $p=.775$, $\eta^2=.002$. Additionally, there was no interaction effect of Stroop condition and Group $F(2, 38)=1.678$, $p=.194$, $\eta^2=.042$ but there was an interaction between Suggestion and Group $F(1, 38)= 4.826$, $p=.034$, $\eta^2=.113$, with medium-highs showing faster RTs under suggestion compared to low-mediums (See figure 1). For the interaction between Suggestion and Stroop condition $F(2, 38)=5.837$, $p=.004$ $\eta^2=.133$ suggesting a reduction in the Stroop effect that was not modified by suggestibility. There was no main effect of Group (Medium-high or low-medium) on RTs $F(1, 38)= .112$, $p=739$, $\eta^2=.003$. No three-way interaction was found between Stroop condition, Suggestion and Group, $F(2, 38)=.933$, $p=.398$, $\eta^2=.024$.

Figure 1.

RTs for medium-highs and low-mediums for all Stroop trials under suggestion and at baseline



For Errors, Mauchly's test of sphericity for both Suggestion and Stroop condition assumed that the assumptions had been met. No correction was therefore needed. Test of sphericity, however, for the interaction between Stroop condition and suggestion had been violated $X^2(2)=11.355$ $p=.003$, therefore a Greenhouse Geisser correction was needed. The number of percentage errors for the Stroop condition was significant $F(2, 38)=5.591$, $p=.005$, $\eta^2=.128$. The percentage errors between the suggestion present and absent conditions was insignificant $F(1, 38)=2.247$, $p=.142$, $\eta^2=.056$. Additionally, no significant interaction was found between the two groups and Stroop condition $F(2, 38)=.279$, $p=.757$, $\eta^2=.007$ and no effect of Group was found for suggestion condition $F(1, 38)=.158$, $p=.693$, $\eta^2=.004$. Using the Greenhouse Geisser correction there was no interaction between Stroop condition

and suggestion F(1.582)= .272, p=.710, η²=.007. There was no effect found for Group on percentage errors F(1, 38)= .744, p=.391, η²=.019.

For corrected interatrial pupil size, Mauchly's test of Sphericity indicated that all assumptions are assumed/met for the suggestion condition, however, for both Stroop condition $X^2(2)=11.02$ p=.004 and the interaction between Stroop condition and suggestion $X^2(2)=9.606$ p=.008 was violated and therefore a Greenhouse Geisser correction was needed. No Effects were found. Using the Greenhouse Geisser correction Stroop condition F(1.590/, 38)=1.789, p=.182, η²=.045, suggestion F(1, 38)=.033, p=.857, η²=.001. Stroop condition and suggestion, F(1.628, 38)=1.566, p=.219, η²=.04. Stroop condition and suggestibility group, F (1.59/1.692, 38)=.237, p=.738/.752, η²=.006 and suggestion and suggestibility group, F(1, 38)=.081, p=.777, η²=.002. There was no effect of Group (Medium-high and low-medium) on corrected interatrial pupil size, F(1, 38)=.178, p=675, η²=.005.

For corrected post-response pupil size, Mauchly's test of sphericity for Stroop condition $X^2(2)=28.406$, p<.001 and Stoop condition and suggestion $X^2(2)=14.544$ p<.001 had been violated, therefore a Greenhouse Geisser correction was needed. For suggestion, sphericity was assumed. No Effects were found. Stroop condition F(1.302, 38)=2.667, p=.100, η²=.066. Suggestion F(1, 38)=.067, p=.797, η²=.002. Stroop condition and suggestion, F(1.509, 38)=.159, p=.793, η²=.004. Stroop condition and Group (Medium-high or Low-medium) F(1.302, 38)=.131, p=.785, η²=.003 and suggestion and group, F(1, 38)=.785, p=.381, η²=.002. There was no effect of Group on corrected post-response pupil size, F(1, 38)= .243, p=.625, η²=.006.

Overall, there were no significant findings for pupil size for any of the time points which could indicate no increase in effort employed following the Word-blindness suggestion. Additionally, there appears to be no increase in effort during incongruent trials which you would expect in the Stroop task (Laeng et al., 2012). For percentage errors there was a significant effect for the Stroop condition only showing the classic Stroop effect which is expected, however, there was no difference following suggestion. As for RTs, there was a significant effect of Stroop condition and for the interaction between suggestion and Group, as well as the interaction between suggestion and Stroop condition.

Discussion

The present study set out to test whether medium-high and low-medium suggestible individuals employ proactive or reactive control mechanisms in response to suggestions by testing effort as measured through pupillometry (Laeng et al., 2011; Kahneman & Beatty, 1966). All participants (both Highs and Lows) completed the Stroop task, both under the Word-Blindness suggestion and at baseline. Despite replicating the WBSE, it did not differ between high and low suggestible individuals (cf. Raz and Campbell, 2011) and there were no effects in the pupil data (cf. Parris et al., 2021). Highly suggestible individuals had quicker response times during the suggestion condition, especially for incongruent trials consistent with past research (Parris & Dienes, 2013; Raz & Campbell, 2011), however, no additional effort was used according to the pupil size data at both the Interatrial or post response phase, which contradicts recent findings (Parris et al., 2021). It may be inferred that, although highly suggestible individuals presented quicker RTs under suggestion, no increased effort or effortful control was employed, however, there was also no effect of congruency on pupil diameter which has been observed due to the increased effort required during incongruent (Laeng et al., 2011) and effortful trials (Laeng et al., 2011; Kahneman & Beatty, 1966) indicating that the pupil data could be misleading. The results did not show that the Stroop effect was reduced more by highs than lows under the suggestion as no three-way interaction was found. The results suggested a significant difference in the number of errors made for Stroop condition, with an increase in errors for incongruent trials as expected. However, no difference in accuracy was found for Group or Suggestion compared to baseline. This suggests no

improvement in accuracy following suggestions and showed the classic Stroop effect in regards to accuracy across the levels of congruency.

A limitation of the present study was that the cut-off points used to define highs and lows; with those scoring above 4 being classed as highs which consequently consisted of medium-highs, and lows defined as below 3 which therefore counted medium-lows. For this reason, the difference between the two groups, and the cut-off point for highly suggestible individuals, may be smaller than in other previous studies, with those scoring 6 or above being classed as highs (Parris et al., 2021) using the SWASH. Other studies using the Stanford hypnotic suggestibility scale C (SHSS-C), gathering from a large data base have previously used individuals scoring 10 or 11 as highs from an 11-point scale, and those scoring below 1 as lows (Raz & Campbell, 2011), which is a significantly larger difference than the above 4 and below 3 cut of points used using the SWASH within the present study. The present data could have selected fewer participants for each group and therefore had a larger SWASH score difference (e.g., the top 20 SWASH scorers as highs and the bottom 20 as lows). This would have still exceeded the 16 highs used in Parris et al., (2012; 2021). However, the present work was based on a grant proposal that stipulated more participants per group. Ultimately, this number was not obtained during the duration of the data collection period for this project.

Although the WBSE has been linked with proactive control as observed within the literature (Landry et al., 2022; Parris et al., 2021), this could be due to a natural tendency to employ different control processes between highs and lows (Braver, 2012) and may be unrelated to the WBSE. That is, differences in cognitive control

may be observed in the baseline state i.e., not following a given suggestion. This possibility is explored in the next experiment.

Experiment 2: Cognitive control employed by high and low suggestible individuals outside of the hypnotic context

Key theories of hypnotic responding posit that high and low hypnotically suggestible individuals differ in the extent to which they employ cognitive control mechanisms (see Parris, 2017, for a review). However, research to date is mixed providing no evidence either in favour or against the idea that these two groups of individuals differ in this capacity (Parris, 2017; Landry et al, 2022). What most of this research has in common however is the tendency to view cognitive control as a single construct that either is or is not present/efficient. In contrast to this approach, the Dual Mechanism of Control (DMC) framework distinguishes between two forms of control: proactive and reactive control (Braver, 2012). Proactive control involves the preparation and maintenance of goals in order to carry out goal-related behaviour. This, however, can use a lot of attentional resources and can have high metabolic costs because it is stimulus-independent (Goschke, 2003) and is reliant on expectations and anticipation (Braver, 2012). In contrast, reactive control is activated or triggered, in response to a cue or stimulus and may seem effortless. Here, goal representations are only activated in response to the relevant stimulus and is therefore a more efficient form of control (Braver, 2012).

Cognitive control, which may differ between highs and lows could be a potential predictor of involuntariness as seen in the ‘Classic suggestion effect’ (Bowers, 1982; Weitzenhoffer, 1974), which explains how experiences of suggestions leads to involuntary and effortless responses in highly suggestible individuals and is not yet understood. Control use employed by highs following suggestions has been shown to increase proactive control use (Landry et al., 2022;

Parris et al., 2021), however, there is little research to validate these findings. Moreover, it has been suggested that control use may naturally differ between groups (Braver, 2012) but this has yet to be explored in the context of hypnotic suggestibility.

Given the dual-mechanisms of control framework, DMC theorists have tried to develop ways of measuring these forms of control independently. They have recently achieved their goal using a modified version of the Stroop task (Stroop, 1935; see Gonthier et al., 2016). The Stroop task is a computer-based task in which participants are asked to respond to congruent, incongruent and neutral trials. During this task, interference of the word, especially in incongruent trials, slows reaction times (Bugg et al., 2008) and multiple levels of control may be used during trials. The ability to alter the level of proportion congruency (PC) during trials allows the manipulation of cognitive demands, making the Stroop task a good way of testing cognitive control mechanisms (Gonthier et al., 2016).

Gontheir et al., (2016), explored proactive and reactive control using an animal Stroop task. Participants completed two conditions, List-Wise Proportion Congruency (LWPC) and Item-Specific Proportion Congruency (ISPC). LWPC was split up into two trial blocks, List-Wise mostly incongruent (LWmi) and List-wise mostly congruent (LWmc). The experiment was split into two experiments (1a and 1b) and both followed a within-subjects design. 1a consisted of 35 participants who completed the experiment in two sessions, a week apart, whereas, 1b, consisted of 58 participants, who completed the experiment in a single session lasting approximately 1 hour. There was no change in effects between experiments 1a and 1b. LWPC was used as a measure of proactive control and ISPC was used as a measure of reactive control

use. All participants elicited LWPC and ISPC effects and these effects were shown to be dissociable (Gontheir et al., 2016).

Recent studies investigating proactive and reactive control in the context of suggestion have indicated that suggestibility is linked with proactive control use (Landry et al., 2022; Parris et al., 2021), with highly suggestible individuals eliciting increased proactive control in the suggestion condition, as opposed to the control where no suggestion was present. It has also been suggested that highly suggestible individuals may have a natural tendency to employ reactive control over proactive strategies (Parris, in prep). This study aims to test proactive and reactive control mechanisms employed by highs and lows, outside of the hypnotic context. This will explain whether differences in control use naturally differ between the two groups. Although suggestions in highly suggestible individuals may have indicated increased proactive control use in previous studies (Landry et al., 2021; Parris et al., 2021), these individuals may have a tendency to employ certain control mechanisms even outside of the hypnotic context and not just in response to suggestions. To test this, this study aims to compare proactive and reactive control use in both high and low suggestible individuals. It is hypothesised that control use naturally differs between high and low suggestible individuals.

Method

Design

This study used a correlational design to permit analysis by multiple regression. An index of proactive control and an index of reactive control (as per Gonthier et al., 2016) will be the predictor variables. Hypnotic suggestibility, hypnotic involuntariness and hypnotic effortlessness are the dependent variables.

Participants

An a priori analysis was conducted using G*Power to determine the sample size required. The sample size required to achieve an 80% power for detecting an effect size of 0.1 was 100. We originally aimed to test participants from a pool of participants pre-screened on our chosen hypnotic suggestibility screening scale, however, due to lack of response and COVID, we had to recruit more participants to undergo the screening process in a separate session prior to the Stroop task. Although we initially aimed for 100 participants, unfortunately, due to time constraints, 60 participants were included within the dataset.

A total of 60 participants participated in this experiment (11 Males, Mean age= 20.5, SD= 4.1), using the combined objective and subjective scores (Median 3.455, SD 1.51).

Materials

An animal Stroop task was used as in Gontheir et al., (2016), with congruent, incongruent and neutral trials with three conditions which consisted of varying levels of congruency; LWPC, implemented into two trial blocks as a measure of proactive control use. LWmc consisted of 75 PC items and 184 trials; LWmi which consisted of

25 PC items and 184 trials. ISPC, as a measure of reactive control, was implemented in a singular bock, in a trial-by-trial fashion consisting of both 75PC and 25PC with 432 trials. Each condition had PC 50 unbiased items (Pig, Seal, Cow and Frog) to allow unbiased assessments of transfer costs. All trials consisted of a practice trial before the experiment began to allow participants to get familiar with the task. The stimuli consisted of images which corresponded with words of animals (Bird, Cat, Dog, Fish). The words and pictures matched for congruent trials but not for incongruent.

Stimuli were presented using a standard PC and monitor displaying at 120 Hz, displaying Images in black and white. A Cedrus voice key (SV-1) was used to record time responses from participants while the experimenter pressed the corresponding key to record their response accuracy. Before each block, the voice key was calibrated to match the participant's voice to avoid interference and to ensure their voice was registered.

The Sussex-waterloo scale of hypnotisability (SWASH) was used as a measure of hypnotic ability (Lush et al., 2018). For participants who had not already undergone the screening process, this was presented via a video in a session prior to the Animal Stroop task and participants were required to record their experiences in the SWASH response booklet (See Appendix A) which included the Sense of Agency Rating scale (SOARs) (Polito et al., 2013).

Procedure

Participants who were recruited via SONA were invited to complete the SWASH and SOARS in a separate session before participating in the Stroop task. Participants were presented with an information sheet and consent form (See Appendix C) upon

arrival to consent to the study. After consenting, participants were set up on the computer with the voice key which was calibrated to their voice and tested to avoid any interference from breathing or other background noise.

Once set up, participants completed three conditions; 384 LWmc trials (96 PC-50 and 288 PC-75), 384 LWmi trials (96 PC-50 and 288 PC-75) and 432 ISPC trials (192 PC-75, 192 PC-5 and 48 PC-50 within the second half of the block). Participants were given opportunities for breaks between each trial block or halfway through if required and 22 practice trials occurred at the start of every trial for participants to get familiar with the task. Time responses were recorded via the voice key and the experimenter pressed the corresponding key to their response to account for accuracy.

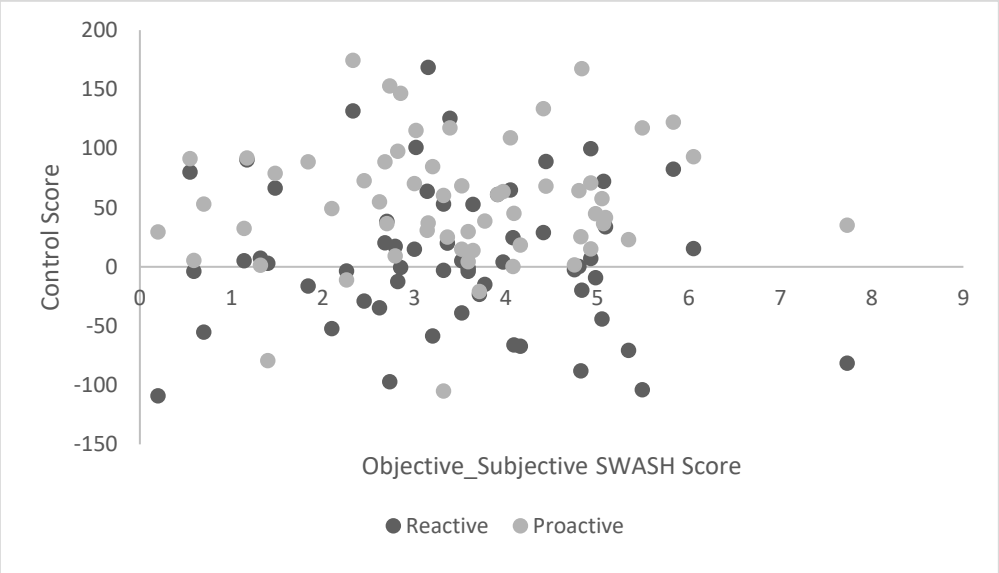
Results

Multiple regression analyses were conducted to investigate whether proactive and reactive control use predicted aspects of the hypnotic experience.

The Model for proactive and reactive control on suggestibility was not significant $F(2,57) = .415$, $p = .662$ with $R^2 = .014$. For the level of reactive control, $\beta = -.002$, $t(57) = -.662$, $p = .511$. As for Proactive control $\beta = .003$, $t(57) = .694$, $p = .491$.

Figure 2.

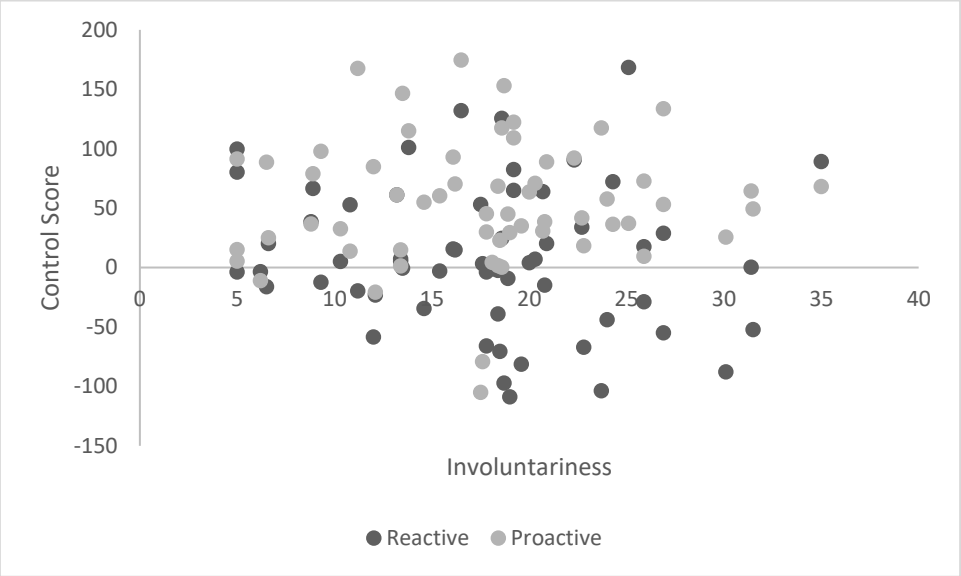
Scatter plot to show proactive and reactive control scores for SWASH



The model for proactive and reactive control on involuntariness was not significant, $F(2, 57) = .589$, $p = .558$ with $R^2 = .02$. For proactive control, $\beta = .009$, $t(57) = .505$, $p = .615$ and for reactive control, $\beta = -.015$, $t(57) = -1.009$, $p = .317$.

Figure 3.

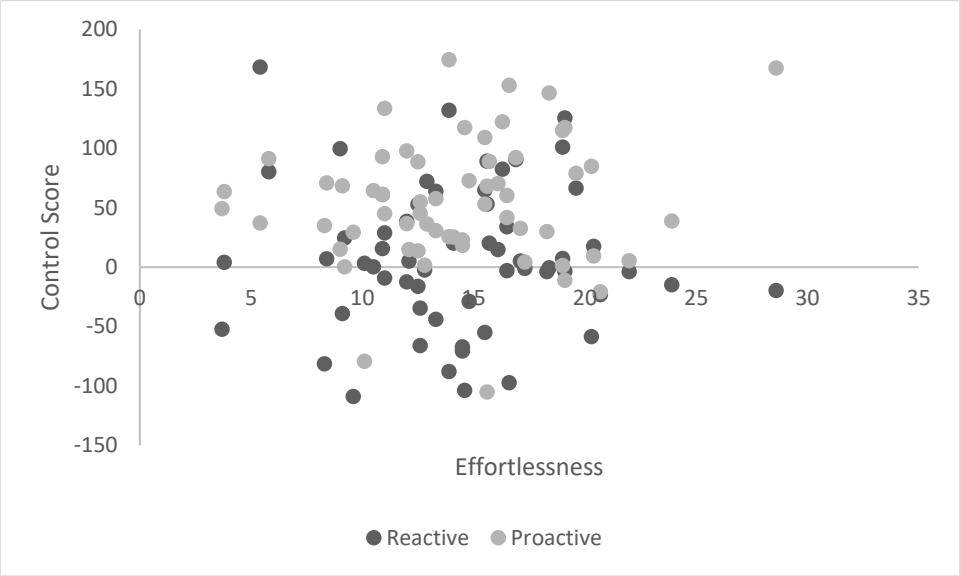
Scatter plot to show reactive and proactive control scores for involuntariness



The model for proactive and reactive control on effortlessness was not significant, $F(2, 57)= .482$, $p=.62$, with $R^2=017$. For proactive control, $\beta=.011$, $t(57)=.949$, $p=.347$ and for reactive control $\beta=-.004$, $t(57)=-.351$, $p=.727$.

Figure 4.

Scatter plot to show proactive and reactive control scores for effortlessness



Overall, the results suggested no relationship between proactive and reactive control on suggestibility, nor for effortless or involuntariness experienced following suggestions.

Discussion

The current study aimed to test whether proactive and reactive control mechanisms predict hypnotic ability. Further, the present study aimed to test whether proactive or reactive control predicts the effortless or involuntariness individuals experience. The findings suggested that neither proactive nor reactive control use predicted hypnotic suggestibility. Involuntariness and effortlessness were also not predicted by proactive or reactive control mechanisms and thus failed to help understand the classic suggestion effect (Bowers, 1982; Weitzenhoffer, 1974) which is commonly observed. The findings may indicate that if highs elicit increased proactive control (Landry et al., 2022), this may be a consequence of responding to a given suggestion as opposed to a natural tendency to employ proactive control mechanisms. More research is therefore needed to understand the differences in cognitive control between highs and lows (Parris et al., 2017; Landry et al., 2022). Further research will also help to understand effortless and involuntary experiences seen in 'the classic suggestion effect' (Bowers, 1982; Weitzenhoffer, 1974) following suggestions.

One limitation of the current study may be that the sample size of 60 may be too low to find an effect. The median objective subjective SWASH score was 3.455 with a SD of 1.5 indicating the majority of scores were quite close together and may not show a clear relationship across high and low suggestible individuals. Due to limited research investigating cognitive control in highs and lows outside of hypnosis, there may be a natural tendency difference between highs and lows (Braver, 2012) that was not detected in the present research. A replication with a larger sample size is needed before strong conclusions can be drawn.

General Discussion

The aim of the experiments presented herein was to assess the tendency to employ proactive and/or reactive control in highs, both following a given suggestion (Experiment 1) and at baseline (Experiment 2).

Highs may not employ any additional effort during suggestions in order to achieve increased reaction times and could therefore be down to reactive mechanisms, which would contradict recent findings (Landry et al., 2022). To back up the idea of response to suggestions possibly being linked with reactive control mechanisms, Implementation intentions, which are triggered in response to stimulus, have previously been linked with response to suggestions (Kirsch & Lynn, 1997) and it could be argued that reactive control may be naturally employed by highly suggestible individuals (Braver, 2012). Additionally, Implementation intentions have been found to increase hypnotic ability after the hypnotic induction (Schweiger et al., 2012). Given this, it could be argued that reactive control may be a potential predictor of hypnotic ability but has yet to be investigated.

The present findings back up the idea that highly suggestible individuals have quicker RTs following suggestion as opposed to baseline (Parris et al., 2012; Parris & Dienes, 2013; Parris et al., 2020; Raz & Campbell, 2011) but fails to understand how much the Stroop effect was reduced. The findings do not show a difference in accuracy between the two groups at baseline or under suggestion, which has been previously found (Parris & Dienes, 2013; Raz & Campbell, 2011). Additionally, the current study contradicts past findings, which suggests increased pupil size during incongruent trials (Laeng et al., 2011) due to an increase in effort employed. This could be due to no increased effort being employed under any of the conditions

across participants. Additionally, no increased effort appears to be found via pupil size following suggestions even when RTs are increased, contradicting past research (Parris et al., 2021).

More research may be needed in order to understand why highly suggestible individuals respond with increased RTs following suggestions. Due to the failure to find a difference in pupil size following the Stroop phenomena (Laeng et al., 2011), a replication with a larger sample including participants more obviously defined as highs and lows would help to consolidate whether suggestions affect control use in highly suggestible individuals following the WBSE and whether this leads to increased effort as seen via pupil size (Laenge et al., 2011; Kahneman & Beatty, 1966; Parris et al., 2020) or whether there is no additional effort employed. Additionally, it may be worth investigating whether highs and lows naturally differ in the control use they tend to employ in order to investigate whether this increased proactive control use (Landry et al., 2022) could be a potential predictor of hypnotic ability as opposed to a consequence of suggestions within highly suggestible individuals.

Another potential explanation for differences in highs and lows could be factors such as dissociation (Wolfradt & Mayer, 1998). Research has previously found that highly suggestible individuals score higher for dissociation, absorption and anxiety than controls, indicating that these factors may act as potential predictors for hypnotic suggestibility. The research around dissociation and suggestibility, however, has provided mixed findings (Dienes et al., 2009), therefore more research would help to explain the link between suggestibility and dissociation factors.

Expectations might also be linked with an individual's likelihood of accepting a given suggestion, (Dienes & Perner, 2007; Reategui, 2020) with correlates increasing after the hypnotic induction (Reategui, 2020). Moreover, proactive control has been suggested to be linked with expectations (Braver, 2012). This could suggest proactive control could be a consequence of accepting a given suggestion and might be due to the maintenance of the suggestion leading up to the intended outcome behaviour. Expectation, however, may not be a direct link to hypnotic responsiveness and could be related to experiences of involuntariness (Dienes & Perner, 2007). This might indicate that cognitive control may be a potential mediator between expectations and involuntariness under suggestions.

Overall, proactive and reactive control mechanisms may not be predictors of hypnotic ability and may in fact be a consequence of responding to suggestions (Landry et al., 2022). Proactive and reactive control was not found to be linked with involuntariness and effortlessness and therefore failed to explain the 'classic suggestion effect' seen within the literature (Bowers, 1982; Weitzenhoffer, 1974). A replication, however, with a larger sample including more highly suggestible individuals, may help to consolidate the current findings which have not yet been explored. A comparison of control use before and after the word-blindness suggestion may also help to understand whether suggestions lead to an increase in proactive mechanisms and could explain to what degree. Further research may also be worth exploring other predicting factors such as dissociation (Wolfradt & Mayer, 1998) and expectations (Reategui, 2020; braver, 2012).

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Appendices

Appendix A

SWASH response booklet with SOARS

DO NOT OPEN THIS BOOKLET UNTIL THE EXAMINER SPECIFICALLY INSTRUCTS YOU TO DO SO.

Please supply the information requested below in block capitals:

Name_____ Age____ Gender____

Degree _____

Year of study_____

E-mail address_____

Today's Date_____ Time_____

Have you ever been hypnotized before? Yes ___ No ___

If so, please cite the circumstances and describe your experiences. Please be brief:

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE SPECIFICALLY INSTRUCTED TO DO SO.

Please write down now, briefly, in your own words, a list of the things that happened since the hypnotic induction began. Do not go into detail. Spend two minutes, no longer, in writing your reply. Please DO NOT TURN THIS PAGE until the examiner specifically instructs you to do so.

PLEASE DO NOT RETURN TO PAGE 1

On this page write down a list of anything else that you now remember that you did not remember previously. Please do not go into detail. Spend two minutes, no longer, in writing out your reply. Please DO NOT TURN THIS PAGE until the examiner specifically instructs you to do so.

PLEASE DO NOT RETURN TO EARLIER PAGES

ITEM SCORING SECTION

Listed below in chronological order are the specific happenings which were suggested to you during the standard hypnotic procedure. We wish you to estimate whether or not you objectively responded to these nine suggestions, that is, whether an onlooker would have observed that you did or did not make certain definite responses by certain specific criteria. You will also be asked to provide a subjective rating for each suggestion, that is, how strongly you experienced the effects of the suggestion.

It is understood that your estimates may in some cases not be as accurate as you might wish them to be and that you might even have to guess. But we want you to make whatever you feel to be your best estimate regardless.

Beneath a description of most of the suggestions are two sets of responses, labeled A and B which will be used to report your objective rating. Please circle either A or B for these questions, whichever you judge to be the more accurate. Please answer every question. Failure to give a definite answer to every question may lead to disqualification of your record. For a few of the suggestions, a special scale has been devised. Select the response that is the best estimate of your experience. Your subjective rating for each suggestion can be reported by circling a number on a scale from 0 to 5. Instructions for interpreting the subjective experience scale will be given for each suggestion.

0. HYPNOTIC INDUCTION

We began the session with a hypnotic induction in which you were told you were entering a state of hypnosis.

SUBJECTIVE RATING: On a scale from 0 to 5, to what degree did you enter a hypnotic state, where 0 means your general state of consciousness was just the same as normal, 1 means you were slightly hypnotized and 5 means you entered very deep hypnosis? Circle one:

Not at all 0 1 2 3 Deep trance 4 5

1. HAND LOWERING (RIGHT HAND)

You were told to extend your right arm straight out and feel

it becoming heavy as though a weight were pulling the hand and arm down.

OBJECTIVE RATING: Would you estimate that an onlooker would have observed that your hand lowered at least six inches (before the time you were told to let your hand down deliberately)?
Circle one: A. My hand had lowered at least six inches by then.
B. My hand had lowered less than six inches by then.

SUBJECTIVE RATING: On a scale from 0 to 5, how strongly did you feel your hand becoming heavy, where 0 means you felt your arm was no more heavy than normal and 5 means you felt your arm becoming as heavy as if you had a heavy object in your hand, pulling it down?
Circle one:
Normal 0 1 2 3 Very heavy 4 5

2. MOVING HANDS TOGETHER

You were next told to hold your hands out in front of you about a foot apart and then told to imagine a force pulling your hands together.

OBJECTIVE RATING: Would you estimate that an onlooker would have observed that your hands were not over six inches apart (before you were told to return your hands to their resting position)?
Circle one: A. My hands were less than six inches apart by then.
B. My hands were more than six inches apart by then.

SUBJECTIVE RATING: On a scale from 0 to 5, how strongly did you feel a force between your hands, where 0 means you felt no force at all and 5 means you felt a force so strong it was as if your hands were real magnets?
Circle one:
No force 0 1 2 3 Strong 4 5

3. EXPERIENCING OF MOSQUITO

You were next told to become aware of the buzzing of a mosquito which was said to become annoying, and then you were told to brush it off.

OBJECTIVE RATING: Would you estimate that an onlooker would have observed you make any grimacing, any movement, any outward acknowledgement of an effect (regardless of what it was like subjectively)?
Circle one: A. I did make some outward acknowledgement.
B. I did not make any outward acknowledgement.

SUBJECTIVE RATING: On a scale from 0 to 5, how strongly did you feel the sensation of a mosquito being there, in either sound or touch, where 0 means you felt no sensation and 5 means you felt by any means as if there actually was a mosquito there?
Circle one:
No sensation 0 1 2 3 Like a real 4 5

4. TASTE EXPERIENCE

You were next told that you would have a sweet taste in your mouth, and then you were told that you would have a sour taste in your mouth.

OBJECTIVE RATING: How strong was the sweet taste in your mouth?
Circle one: none vague weak strong

Did you make any facial movements, such as lip movements or grimacing, that an onlooker would have observed?
Circle one: YES NO

How strong was the sour taste in your mouth?
Circle one: none vague weak strong

Did you make any facial movements, such as lip movements or grimacing that an onlooker would have observed?
Circle one: YES NO

SUBJECTIVE RATING a: On a scale from 0 to 5, how strongly did you taste a sour taste in your mouth, where 0 means you felt no taste at all and 5 means you felt a strong taste?
Circle one:
No taste 0 1 2 3 Strong 4 5

SUBJECTIVE RATING b: On a scale from 0 to 5, how strongly did you taste a sweet taste in your mouth, where 0 means you felt no taste at all and 5 means you felt a strong taste?
Circle one:
No taste 0 1 2 3 Strong 4 5

5. ARM RIGIDITY (RIGHT)

You were next told to extend your right arm straight out, then to notice it becoming stiff, and then told to try to bend it.

OBJECTIVE RATING: Would you estimate that an onlooker would have observed that there was less than two inches of arm bending (before you were told to stop trying)?
Circle one: A. My arm was bent less than two inches by then.
B. My arm was bent at least two inches by then.

SUBJECTIVE RATING: On a scale from 0 to 5, how stiff did your arm feel, where 0 means no more stiffness than normal and 5 means you could feel a stiffness so compelling no amount of effort would overcome it?
Circle one:
Normal 0 1 2 3 Very stiff 4 5

6. ARM IMMOBILIZATION (LEFT ARM)

You were next told how heavy your left hand and arm felt and then told to try to lift your hand up.

OBJECTIVE RATING: Would you estimate that an onlooker would have observed that you did not lift your hand and arm up at least one inch (before you were told to stop trying)?
Circle one: A. I did not lift my hand and arm one inch by then.
B. I did lift my hand and arm at least one inch by then.

SUBJECTIVE RATING: On a scale from 0 to 5, how strongly did you feel a heaviness in your hand, where 0 means you felt no heaviness at all and 5 means your hand felt so heavy it was as if a very heavy object was actually pressing it down?
Circle one:

Normal/ no ... 0 1 2 3 Very ... 4 5

7. MUSIC HALLUCINATION

Next you were asked to hold your right hand up when you could satisfactorily hear the recording of Happy Birthday to You.

OBJECTIVE RATING:

Circle one: A. I raised my right hand.
B. I did not raise my right hand.

SUBJECTIVE RATING: On a scale from 0 to 5, report how clearly you heard the music, where 0 means you did not hear any music at all and 5 means you heard it so clearly it was as though it was coming from the best sound system.

Circle one:

No ... 0 1 2 3 Clea rly hear 4 5

8. NEGATIVE VISUAL HALLUCINATION

You were next told to open your eyes and look at a picture of two coloured balls. You then recorded the colour of the balls on the back of this booklet.

SUBJECTIVE RATING: On a scale from 0 to 5, how invisible was a third ball, where 0 means you saw three balls clearly, and 5 means you only saw two balls, and any number in between means you had some difficulty in seeing a third ball?

Circle one:

Saw three ... 0 1 2 3 Saw two balls 4 5

9. AMNESIA

You were then told that you would not be able to remember anything you did during the hypnosis session until you were told "now you can remember anything".

SUBJECTIVE RATING: On a scale from 0 to 5, how hard was it to remember events before you were told "now you can remember everything", where 0 means you could remember events as easily as normal and 5 means you found it so difficult to remember it was as if there was an actual blank in your memory?

Circle one:

Nor ... 0 1 2 3 Blan k 4 5

10. POSTHYPNOTIC SUGGESTION

You were told that you would draw a small tree in the upper right hand corner of your response booklet, but that you would forget that you were told to do so.

SUBJECTIVE RATING a:

On a scale from 0 to 5, report how strong an urge you felt to draw a tree, where 0 means you had no urge whatsoever and 5 means you had a clear urge to draw a tree.

Circle one:

No ... 0 1 2 Clea r 3 4 5

SUBJECTIVE RATING b: On a scale from 0 to 5, report how clearly you remembered being given the instruction to draw a tree while you were drawing the tree in your booklet, where 0 means you were able at that time to remember the instruction normally and 5 means you had no memory of the instruction at that time.

Circle one:

Normal Memory ... 0 1 2 No Memory of instructio 4 5

SOARS Scale:

Following the hetero hypnosis session you just had, please score the following statements about each suggestion (1-7) using the following scale:

1 - Strongly agree.
2 - Agree.
3 - More or less agree.
4 - Undecided.
5 - More or less disagree.
6 - Disagree.
7 - Strongly disagree.

1) Hand Lowering (Right Hand)

Involuntariness
- ☐ - I chose how to respond
- ☐ - My experiences and actions were under my control
- ☐ - I felt that my experiences and actions were not caused by me
- ☐ - My experiences and actions felt self-generated
- ☐ - My responses were involuntary

Effortlessness
- ☐ - I embraced the suggestions freely
- ☐ - My experiences and actions occurred effortlessly
- ☐ - Following suggestions was hard
- ☐ - I was mostly absorbed in what was going on
- ☐ - I was reluctant to follow suggestions

2) Moving Hands Together

Involuntariness
- ☐ - I chose how to respond
- ☐ - My experiences and actions were under my control
- ☐ - I felt that my experiences and actions were not caused by me
- ☐ - My experiences and actions felt self-generated
- ☐ - My responses were involuntary

Effortlessness
- ☐ - I embraced the suggestions freely
- ☐ - My experiences and actions occurred effortlessly
- ☐ - Following suggestions was hard
- ☐ - I was mostly absorbed in what was going on
- ☐ - I was reluctant to follow suggestions

3) Experiencing of Mosquito

Involuntariness
- ☐ - I chose how to respond
- ☐ - My experiences and actions were under my control
- ☐ - I felt that my experiences and actions were not caused by me
- ☐ - My experiences and actions felt self-generated
- ☐ - My responses were involuntary

Effortlessness
- ☐ - I embraced the suggestions freely
- ☐ - My experiences and actions occurred effortlessly
- ☐ - Following suggestions was hard
- ☐ - I was mostly absorbed in what was going on
- ☐ - I was reluctant to follow suggestions

4) Taste Experience

Involuntariness
- ☐ - I chose how to respond
- ☐ - My experiences and actions were under my control
- ☐ - I felt that my experiences and actions were not caused by me
- ☐ - My experiences and actions felt self-generated
- ☐ - My responses were involuntary

Effortlessness
- ☐ - I embraced the suggestions freely
- ☐ - My experiences and actions occurred effortlessly
- ☐ - Following suggestions was hard
- ☐ - I was mostly absorbed in what was going on
- ☐ - I was reluctant to follow suggestions

5) Arm Rigidity (Right)

Involuntariness
- [ ] - I chose how to respond
- [x] - My experiences and actions were under my control
- [ ] - I felt that my experiences and actions were not caused by me
- [ ] - My experiences and actions felt self-generated
- [ ] - My responses were involuntary

Effortlessness
- [ ] - I embraced the suggestions freely
- [ ] - My experiences and actions occurred effortlessly
- [ ] - Following suggestions was hard
- [ ] - I was mostly absorbed in what was going on
- [ ] - I was reluctant to follow suggestions

6) Arm Immobilization (Left Arm)
Involuntariness
- [ ] - I chose how to respond
- [x] - My experiences and actions were under my control
- [ ] - I felt that my experiences and actions were not caused by me
- [ ] - My experiences and actions felt self-generated
- [ ] - My responses were involuntary

Effortlessness
- [ ] - I embraced the suggestions freely
- [ ] - My experiences and actions occurred effortlessly
- [ ] - Following suggestions was hard
- [ ] - I was mostly absorbed in what was going on
- [ ] - I was reluctant to follow suggestions

7) Music Hallucination
Involuntariness
- [ ] - I chose how to respond
- [x] - My experiences and actions were under my control
- [ ] - I felt that my experiences and actions were not caused by me
- [ ] - My experiences and actions felt self-generated
- [ ] - My responses were involuntary

Effortlessness
- [ ] - I embraced the suggestions freely
- [ ] - My experiences and actions occurred effortlessly
- [ ] - Following suggestions was hard
- [ ] - I was mostly absorbed in what was going on
- [ ] - I was reluctant to follow suggestions

8) Negative Visual Hallucination
Involuntariness
- [ ] - I chose how to respond
- [x] - My experiences and actions were under my control
- [ ] - I felt that my experiences and actions were not caused by me
- [ ] - My experiences and actions felt self-generated
- [ ] - My responses were involuntary

Effortlessness
- [ ] - I embraced the suggestions freely
- [ ] - My experiences and actions occurred effortlessly
- [ ] - Following suggestions was hard
- [ ] - I was mostly absorbed in what was going on
- [ ] - I was reluctant to follow suggestions

9) Amnesia
Involuntariness
- [ ] - I chose how to respond
- [x] - My experiences and actions were under my control
- [ ] - I felt that my experiences and actions were not caused by me
- [ ] - My experiences and actions felt self-generated
- [ ] - My responses were involuntary

Effortlessness
- [ ] - I embraced the suggestions freely
- [ ] - My experiences and actions occurred effortlessly
- [ ] - Following suggestions was hard
- [ ] - I was mostly absorbed in what was going on
- [ ] - I was reluctant to follow suggestions

10) Posthypnotic Suggestion
Involuntariness
- [ ] - I chose how to respond
- [x] - My experiences and actions were under my control
- [ ] - I felt that my experiences and actions were not caused by me
- [ ] - My experiences and actions felt self-generated
- [ ] - My responses were involuntary

Effortlessness
- [ ] - I embraced the suggestions freely
- [ ] - My experiences and actions occurred effortlessly
- [ ] - Following suggestions was hard
- [ ] - I was mostly absorbed in what was going on
- [ ] - I was reluctant to follow suggestions

Appendix B

Information sheet and consent form for Investigating cognitive control though post-hypnotic suggestion. Ethics ID: 45841

Bournemouth University

Participant Information Sheet

The title of the research project:

Investigating cognitive control through post-hypnotic suggestion

Invitation to take part

You are being invited to take part in a research project. You will be compensated for your time with either £ 20 or 2 Experiment Participation credits. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Who is organising/funding the research?

This research is led by Associate Professor Ben Parris in the Department of Psychology and is funded by the British Academy and Leverhulme Trust.

What is the purpose of the project?

The aim of this project is to determine whether a post-hypnotic suggestion (which is a suggestion given whilst a participant is under hypnosis but is experienced only when the participant is no longer under suggestion and is activated by a cue such as a clap) can improve performance on a well-known computer-based task called the Stroop task (which is when a participant is asked to name the colour of the font a word is presented in when that word can connote a different colour e.g., the word BLUE presented in red).

Why have I been chosen?

We are looking for volunteers to take part. We are recruiting from Bournemouth University's student population as well as from the wider areas of Bournemouth and Poole.
Additionally, you may have previously taken part in a hypnotisability screening session in which you responded to suggestions. The experiences you reported allowed us to assess how likely you are to respond to suggestions (either likely or not likely). You have been chosen because of the experiences you reported.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a participant agreement form. You can withdraw from participation during the screening any time and without giving a reason. If you decide to withdraw we will usually remove any data collected about you from the study. Once the screening has finished you may still be able to withdraw your data up to the point where the data is analysed and incorporated into the research findings or outputs. At this point your data will usually become anonymous, so your identity cannot be determined, and it may not be possible to identify your data within the anonymous dataset. Withdrawing your data at this point may also adversely affect the validity and integrity of the research. Deciding to take part or not will not impact upon/adversely affect your education or studies at BU (or that of others).

Can I change my mind about taking part?

Yes, you can stop participating in study activities at any time and without giving a reason.

If I change my mind, what happens to my information?

After you decide to withdraw from the study, we will not collect any further information from or about you.

As regards information we have already collected before this point, your rights to access, change or move that information are limited. This is because we need to manage your information in specific ways in order for the research to be reliable and accurate. Further explanation about this is in the Personal Information section below.

What would taking part involve?

In the present study you will be screened for hypnotisability using a commonly used and research-verified screening procedure. It will take up to one hour of your time. For the screening, which will take place via a video recording, you will be sat in a room where you live and the hypnotist will take you through a relaxation induction procedure. Once you are relaxed the hypnotist will deliver a series of suggestions for which you will be asked to try to experience perceptions and sensations such as your arm feeling heavy or becoming rigid. After the suggestions you will be de-hypnotised and will be asked to rate your experience in via an online questionnaire. You will also be asked to rate how involuntary and effortless each of the experiences felt.

The second part would involve coming to a testing lab at the university where you will be asked to play a computer game (the aforementioned Stroop task) on a machine that tracks where you look on a computer screen. This task would involve responding to the font colour that a word is presented in by looking at one of four surrounding patches. You would be asked to do this task twice; once when the suggestion has been activated, and once in your normal, everyday state.

What are the advantages and possible disadvantages or risks of taking part?

Whilst there are no immediate benefits for those people participating in the project, this research is exploring the possible use of hypnosis as a powerful tool in self-control and will add to the growing literature on the use of hypnosis in neuroscience research and thus contribute to our understanding of the clinical and medical uses of hypnosis. Moreover, the research will have implications for understanding placebo effects commonly observed in medical and research settings since both placebo and hypnosis involve suggestion. You will be compensated for your time either financially or with an experiment participant credit (depending on which you are eligible for).

It is important that you understand that the British Psychological Society have stated that taking part in research involving hypnosis has no risks or disadvantages greater than that associated with any psychological experiment (for access to this report see here: https://ukhypnos-wpengine.netdna-ssl.com/wp-content/uploads/2015/01/The-Nature-of-Hypnosis_0.pdf).

What type of information will be sought from me and why is the collection of this information relevant for achieving the research project's objectives?

We will be collecting three types of information from you: 1) Your score on the well-established hypnotisability scale, which is based on your ratings of your experience, which we will use to separate participants into high, medium and low hypnotisability groups; 2) Your ratings of the involuntariness of each suggestion you experience; 3) Your ratings of the effortless of each suggestion you experience. We need this information so that, with their consent, we can invite people back to take part in future studies should their ratings and score be suitable for the future projects. This will require adding your name and contact details to a database that can be accessed by Dr. Ben Parris to identify people scoring in ranges suitable for particular studies.

Other than your name, contact details, age and nationality we will be collecting three types of information from you: 1) response times; 2) The number of times you look at the wrong patch; 3) Pupil sizes. Together this information will tell us how well you perform the task and will give us an insight to any strategies you might use.

Will I be recorded, and how will the recorded media be used?

You will not be video-recorded. Only you eye movements will be recorded. We will use these recordings to access the information described above.

How will my information be managed?

Bournemouth University (BU) is the organisation with overall responsibility for this study and the Data Controller of your personal information, which means that we are responsible for looking after your information and using it appropriately. Research is a task that we perform in the public interest, as part of our core function as a university.

Undertaking this research study involves collecting and/or generating information about you. We manage research data strictly in accordance with:

- Ethical requirements; and
- Current data protection laws. These control use of information about identifiable individuals, but do not apply to anonymous research data: "anonymous" means that we have either removed or not collected any pieces of data or links to other data which identify a specific person as the subject or source of a research result.

BU's Research Participant Privacy Notice sets out more information about how we fulfil our responsibilities as a data controller and about your rights as an individual under the data protection legislation. We ask you to read this Notice so that you can fully understand the basis on which we will process your personal information.

Research data will be used only for the purposes of the study or related uses identified in the Privacy Notice or this Information Sheet. To safeguard your rights in relation to your personal information, we will use the minimum personally-identifiable information possible and control access to that data as described below.

Publication
You will not be able to be identified in any external reports or publications about the research without your specific consent. Otherwise your information will only be included in these materials in an anonymous form, i.e. you will not be identifiable.

Security and access controls

BU will hold the information we collect about you in hard copy in a secure location and/or on a BU password protected drive where held electronically.

Personal information which has not been anonymised will be accessed and used only by appropriate, authorised individuals and when this is necessary for the purposes of the research or another purpose identified in the Privacy Notice. This may include giving access to BU staff or others responsible for monitoring and/or audit of the study, who need to ensure that the research is complying with applicable regulations.

Sharing your personal information with third parties
Only BU staff [and the BU student(s)] working on the research project, will have access to your personal information in non-anonymised form.

Further use of your information
The information collected about you may be used to support other research projects in the future and access to it in this form will be restricted to BU staff and the BU student(s) working on hypnosis-related projects and they will use this information to assess your suitability for projects and to contact you to invite you to take part in future paid and unpaid research studies.

Keeping your information if you withdraw from the study
If you withdraw from active participation in the study we will keep information which we have already collected from or about you, if this has on-going relevance or value to the study. This may include your personal identifiable information. As explained above, your legal rights to access, change, delete or move this information are limited as we need to manage your information in specific ways in order for the research to be reliable and accurate. However if you have concerns about how this will affect you personally, you can raise these with the research team when you withdraw from the study.

You can find out more about your rights in relation to your data and how to raise queries or complaints in our Privacy Notice.

Retention of research data

Project governance documentation, including copies of signed **participant agreements**: we keep this documentation for a long period after completion of the research, so that we have records of how we conducted the research and who took part. The only personal information in this documentation will be your name and signature, and we will not be able to link this to any anonymised research results.

Research results:

We will keep your personal information in identifiable form for a period of several years after completion of the research study. Although published research outputs are anonymised, we need to retain underlying data collected for the study in a non-anonymised form to enable the research to be audited and/or to enable the research findings to be verified.

You can find more specific information about retention periods for personal information in our Privacy Notice.

We keep anonymised research data indefinitely, so that it can be used for other research as described above.

Contact for further information

If you have any questions or would like further information, please contact Nicholia Fiolaki nfiolaki@bournemouth.ac.uk or Dr. Ben Parris. For further information please contact Dr Ben Parris on bparris@bournemouth.ac.uk or 01202 965485. You could also visit Dr Parris' office on the third floor of Poole House in room P331.

In case of complaints
Any concerns about the study should be directed to Dr Ben Parris. If you concerns have not been answered by Dr Ben Parris, you should contact Prof. Tiantian Zhang, Deputy Dean for Research and Professional Practice in the Faculty of Science and Technology, Bournemouth University by email to researchgovernance@bournemouth.ac.uk.

Finally

If you decide to take part, you will be given a copy of the information sheet and a signed participant agreement form to keep.

Thank you for considering taking part in this research project.

End of document

Ref & Version: 1
Ethics ID number: 45841

Participant Agreement Form

Full title of project: **Investigating cognitive control through post-hypnotic suggestion**

Name, position and contact details of researcher: Nicholia Fiolaki, MRes Student, nfiolaki@bournemouth.ac.uk

Supervisor; Dr Ben Parris - bparris@bournemouth.ac.uk or 01202 965485. You could also visit Dr Parris' office on the third floor of Poole House in room P331.

To be completed prior to data collection activity

Section A: Agreement to participate in the study

You should only agree to participate in the study if you agree with all of the statements in this table and accept that participating will involve the listed activities.

I have read and understood the Participant Information Sheet **Investigating cognitive control through post-hypnotic suggestion** and have been given access to the BU Research Participant Privacy Notice which sets out how we collect and use personal information (https://www1.bournemouth.ac.uk/about/governance/access-information/data-protection-privacy).
I have had an opportunity to ask questions.
I understand that my participation is voluntary. I can stop participating in research activities at any time without giving a reason and I am free to decline to answer any particular question(s).
I agree that BU researchers may access my hypnotisability information as described in the Participant Information Sheet
I understand that taking part in the research will include the following activity/activities as part of the research: • Participate in a standard procedure for measuring hypnotic ability • Take part in an eye tracking Stroop task
I understand that, if I withdraw from the study, I will also be able to withdraw my data from further use in the study **except** where my data has been anonymised (as I cannot be identified) or it will be harmful to the project to have my data removed.
I understand that my data may be included in an anonymised form within a dataset to be archived at the Open Science Framework.
I understand that my data may be used in an anonymised form by the research team to support other research projects in the future, including future publications, reports or presentations.

	Initial box to agree
I consent to take part in the project on the basis set out above (Section A)	

I confirm my agreement to take part in the project on the basis set out above.

Name of participant (BLOCK CAPITALS)	Date (dd/mm/yyyy)	Signature
Name of researcher (BLOCK CAPITALS)	Date (dd/mm/yyyy)	Signature

Once a Participant has signed, **please sign 1 copy** and take 2 photocopies:

- Original kept in the local investigator's file
- 1 copy to be kept by the participant (including a copy of PI Sheet)

End of document

Appendix C

Information sheet and consent form for Cognitive control employed by highs and lows outside of the hypnotic context. Ethics ID: 47084

Bournemouth University

Participant Information Sheet

The title of the research project:

Cognitive control employed by high and low suggestible individuals outside of the hypnotic context

Invitation to take part

You are being invited to take part in a research project. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

What is the purpose of the project?

The aim of the study is to understand whether the differences in cognitive control in high and low suggestible individuals is also observed outside of the hypnotic context. This will help to understand whether these differences are due to hypnotic suggestions in highs and lows or due to a natural tendency to employ certain cognitive control mechanisms.

Why have I been chosen?

You have previously taken part in a hypnotisability screening session in which you responded to suggestions. The experiences you reported allowed us to assess how likely you are to respond to suggestions (either likely or not likely). You have been chosen because of the experiences you reported.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a participant agreement form. You can withdraw from participation during the screening any time and without giving a reason. If you decide to withdraw, we will usually remove any data collected about you from the study and you will only receive compensation for each hour participated.
Once the screening has finished you may still be able to withdraw your data up to the point where the data is analysed and incorporated into the research findings or outputs. At this point your data will usually become anonymous, so your identity cannot be determined, and it may not be possible to identify your data within the anonymous dataset. Withdrawing your data at this point may also adversely affect the validity and integrity of the research. Deciding to take part or not will not impact upon/adversely affect your education or studies at BU (or that of others).

Can I change my mind about taking part?

Yes, you can stop participating in study activities at any time and without giving a reason. If you decide to withdraw after the data is anonymised, you will not be able to due to not being identifiable. You will receive compensation for the time you have participated (1 hour will be credited 1 SONA credit or a £10 amazon voucher depending on eligibility).

If I change my mind, what happens to my information?

After you decide to withdraw from the study, we will not collect any further information from or about you.

As regards information we have already collected before this point, your rights to access, change or move that information are limited. This is because we need to manage your information in specific ways in order for the research to be reliable and accurate. Further explanation about this is in the Personal Information section below.

What would taking part involve?

Taking part would involve coming to a testing lab at the university where you will be asked to play a computer game (the aforementioned Stroop task). This task would involve responding to a picture of an animal on the screen with a word presented in the centre.

What are the advantages and possible disadvantages or risks of taking part?

Whilst there are no immediate benefits for those people participating in the project, this research is exploring the possible use of hypnosis as a powerful tool in self-control and will add to the growing literature on the use of hypnosis in neuroscience research and thus contribute to our understanding of the clinical and medical uses of hypnosis. Moreover, the research will have implications for understanding placebo effects commonly observed in medical and research settings since both placebo and hypnosis involve suggestion. You will be compensated for your time either financially (£10 voucher for 1 hour of participation) or with an experiment participant credit (1 credit for 1 hour of participation) (depending on which you are eligible for).

If you wish to receive the results of the study, please contact the researchers and we will get back to you with the findings.

It is important that you understand that the British Psychological Society have stated that taking part in research involving hypnosis has no risks or disadvantages greater than that associated with any psychological experiment (for access to this report see here: https://ukhypnos-wpengine.netdna-ssl.com/wp-content/uploads/2015/01/The-Nature-of-Hypnosis_0.pdf).

What type of information will be sought from me and why is the collection of this information relevant for achieving the research project's objectives?

Other than your name for consent forms, response times and accuracy data will be collected in response to different presented trials within the animal Stroop task. Together this information will tell us how well you perform the task and will give us an insight to any strategies you might use.

Will I be recorded, and how will the recorded media be used?

You will not be recorded.

How will my information be managed?

Bournemouth University (BU) is the organisation with overall responsibility for this study and the Data Controller of your personal information, which means that we are responsible for looking after your information and using it appropriately. Research is a task that we perform in the public interest, as part of our core function as a university.

Undertaking this research study involves collecting and/or generating information about you. We manage research data strictly in accordance with:

- Ethical requirements; and
- Current data protection laws. These control use of information about identifiable individuals, but do not apply to anonymous research data: "anonymous" means that we have either removed or not collected any pieces of data or links to other data which identify a specific person as the subject or source of a research result.

BU's Research Participant Privacy Notice sets out more information about how we fulfil our responsibilities as a data controller and about your rights as an individual under the data protection legislation. We ask you to read this Notice so that you can fully understand the basis on which we will process your personal information.

Research data will be used only for the purposes of the study or related uses identified in the Privacy Notice or this Information Sheet. To safeguard your rights in relation to your personal information, we will use the minimum personally-identifiable information possible and control access to that data as described below.

Publication
You will not be able to be identified in any external reports or publications about the research without your specific consent. Otherwise your information will only be included in these materials in an anonymous form, i.e. you will not be identifiable.

Security and access controls
BU will hold the information we collect about you in hard copy in a secure location and/or on a BU password protected drive where held electronically.

Personal information which has not been anonymised will be accessed and used only by appropriate, authorised individuals and when this is necessary for the purposes of the research or another purpose identified in the Privacy Notice. This may include giving access to BU staff or others responsible for monitoring and/or audit of the study, who need to ensure that the research is complying with applicable regulations.

Sharing your personal information with third parties
Only BU staff [and the BU student(s)] working on the research project, will have access to your personal information in non-anonymised form.

Further use of your information
The information collected about you may be used to support other research projects in the future and access to it in this form will be restricted to BU staff and the BU student(s) working on hypnosis-related projects and they will use this information to assess your suitability for projects and to contact you to invite you to take part in future paid and unpaid research studies.

Keeping your information if you withdraw from the study
If you withdraw from active participation in the study we will keep information which we have already collected from or about you, if this has on-going relevance or value to the study. This may include your personal identifiable information. As explained above, your legal rights to access, change, delete or move this information are limited as we need to manage your information in specific ways in order for

the research to be reliable and accurate. However if you have concerns about how this will affect you personally, you can raise these with the research team when you withdraw from the study.

You can find out more about your rights in relation to your data and how to raise queries or complaints in our Privacy Notice.

Retention of research data

Project governance documentation, including copies of signed **participant agreements**: we keep this documentation for a long period after completion of the research, so that we have records of how we conducted the research and who took part. The only personal information in this documentation will be your name and signature, and we will not be able to link this to any anonymised research results.

Research results:

We will keep your personal information in identifiable form for a period of several years after completion of the research study. Although published research outputs are anonymised, we need to retain underlying data collected for the study in a non-anonymised form to enable the research to be audited and/or to enable the research findings to be verified.

You can find more specific information about retention periods for personal information in our Privacy Notice.

We keep anonymised research data indefinitely, so that it can be used for other research as described above.

Contact for further information

If you have any questions or would like further information, please contact Nicholia Fiolaki nfiolaki@bournemouth.ac.uk or Dr. Ben Parris. For further information please contact Dr Ben Parris on bparris@bournemouth.ac.uk or 01202 965485.

In case of complaints
Any concerns about the study should be directed to Dr Ben Parris. If you concerns have not been answered by Dr Ben Parris, you should contact Prof. Tiantian Zhang, Deputy Dean for Research and Professional Practice in the Faculty of Science and Technology, Bournemouth University by email to researchgovernance@bournemouth.ac.uk.

Finally

If you decide to take part, you will be given a copy of the information sheet and a signed participant agreement form to keep.

Thank you for considering taking part in this research project.

End of document

Ref & Version: 1
Ethics ID number: 47084

Participant Agreement Form

Full title of project: **Cognitive control employed by high and low suggestible individuals outside of the hypnotic context**

Name, position and contact details of researcher: Nicholia Fiolaki, MRes Student, nfiolaki@bournemouth.ac.uk

Supervisor; Dr Ben Parris - bparris@bournemouth.ac.uk or 01202 965485.

To be completed prior to data collection activity

Section A: Agreement to participate in the study

You should only agree to participate in the study if you agree with all of the statements in this table and accept that participating will involve the listed activities.

I have read and understood the Participant Information Sheet **Investigating cognitive control in high and low suggestible individuals** and have been given access to the BU Research Participant Privacy Notice which sets out how we collect and use personal information (https://www1.bournemouth.ac.uk/about/governance/access-information/data-protection-privacy).
I have had an opportunity to ask questions.
I understand that my participation is voluntary. I can stop participating in research activities at any time without giving a reason and I am free to decline to answer any particular question(s).
I agree that BU researchers may access my hypnotisability information as described in the Participant Information Sheet
I understand that taking part in the research will include the following activity/activities as part of the research: • Take part in an Animal Stroop task
I understand that, if I withdraw from the study, I will also be able to withdraw my data from further use in the study **except** where my data has been anonymised (as I cannot be identified) or it will be harmful to the project to have my data removed.
I understand that my data may be included in an anonymised form within a dataset to be archived at the Open Science Framework.
I understand that my data may be used in an anonymised form by the research team to support other research projects in the future, including future publications, reports or presentations.

	Initial box to agree
I consent to take part in the project on the basis set out above (Section A)	

I confirm my agreement to take part in the project on the basis set out above.

Name of participant (BLOCK CAPITALS)	Date (dd/mm/yyyy)	Signature
Name of researcher (BLOCK CAPITALS)	Date (dd/mm/yyyy)	Signature

Once a Participant has signed, **please sign 1 copy** and take 2 photocopies:

- Original kept in the local investigator's file
- 1 copy to be kept by the participant (including a copy of PI Sheet)

End of document