Inattentional Blindness, Absorption, Working Memory Capacity, and Paranormal Belief

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Abstract

Two studies investigated the relationship between inattentional blindness, paranormal belief/experience, absorption, and working memory capacity (WMC). 'Inattentional blindness' (IB) refers to the failure to consciously register an unexpected visual stimulus or event when attention is diverted to a different task. Absorption is a highly focused state where individuals are unaware of stimuli outside of attentional focus and is linked with paranormal belief. It was predicted that IB individuals would have higher absorption scores and be more likely to believe in the paranormal than non-inattentionally blind (NIBs) individuals. In both studies, IBs had higher absorption and paranormal belief scores than NIBs, as predicted. In addition, Study 2 measured WMC. Although absorption predicted IB, when WMC and paranormal belief were entered into the analysis, only WMC predicted IB with IBs having lower WMC than NIBs. These data offer support for a cognitive deficit account of paranormal belief.

Inattentional Blindness, Absorption, Working Memory Capacity, and Paranormal Belief

It is well documented that objects appearing in our visual field often go unnoticed, and this is more likely to happen if we are busily involved in a resource-consuming activity. Such a failure of attention has been called *Inattentional Blindness* (IB) by Mack and Rock (1998) and is a frequent cause of errors in eyewitness testimony. IB is demonstrated in the classic 'Gorillas in Our Midst' (Simons & Chabris, 1999) study where a person in a gorilla suit is not seen by approximately half of the participants who are engaged in counting the number of ball passes between people in white shirts while simultaneously ignoring ball passes between people in black shirts. More recently, Most et al. (2001, see Simons, 2003) developed an IB task in which black and white letters bounce around a screen and participants are required to monitor targets (white letters) but ignore distractors (black letters). An unexpected red cross arriving on the scene often goes unnoticed.

Most, Scholl, Clifford, and Simons (2005) propose that inattentional blindness is the converse phenomenon of attentional capture and put forward a model based on Neisser's (1976) 'perceptual cycle' conceptualization. Whether the unexpected stimulus is noticed mainly depends on the physical characteristics of the display (e.g., proximity and conspicuity; see Jensen, Yao, Street, & Simons, 2011; Mack & Rock, 1998) but expectation and attentional state are also influential in determining whether or not the unexpected item will be seen. Thus, it is generally accepted that inattentional blindness is a consequence of both top-down and bottom-up factors. However, differences between individuals also play a part (e.g.,

Clifasefi, Takarangi, & Bergman, 2006; Hannon & Richards, 2010; Memmert, 2006). In a series of experiments, people with low working memory resources have been found to be more likely to be inattentionally blind (Hannon & Richards, 2010; Richards, Hannon, & Derakshan, 2010; Richards, Hannon, & Vitkovitch, 2012). We have also observed difference in low-level saliency detection, with people who are inattentionally blind being less sensitive to stimuli with low saliency levels compared to non-inattentionally blind individuals (Papera, Cooper, & Richards, 2013).

Another candidate for predicting IB status is absorption which is a highly focused attentional state in which the individual is unaware of unattended objects or events. Susceptibility to such states can be measured as a personality trait, indicating "the tendency to become engrossed in one's ongoing experience" (Kerns, Karcher, Raghavan, & Berenbaum, 2014, p. 67), using Tellegen's Absorption Scale (TAS; Tellegen & Atkinson, 1974). We therefore predict that individuals who are IB in a sustained attention task would score higher than others on this scale.

Moreover, absorption correlates, albeit moderately, with both paranormal belief (Glicksohn & Barrett, 2003; Nadon & Kihlstrom, 1987; Palmer & Van Der Velden, 1983) and reports of subjective paranormal (Glicksohn, 1990; Irwin, 1985) and mystical experiences (Mathes, 1982; Spanos & Moretti, 1988). If IB status is related to absorption, we might therefore predict that IB participants would have higher paranormal belief/experience scores than non-inattentionally blind participants (NIBs). Many ostensibly paranormal experiences are based upon the fact that the 'experiencer' could not explain a particular event, e.g., apparently

inexplicable movement of an inanimate object. Often a mundane explanation would plausibly solve the mystery by simply assuming that the claimant had failed to process some aspect of the original situation (e.g., the presence of an agent to move the object).

This is only one way in which absorption may lead to reports of ostensibly paranormal experiences. As shown by Glicksohn and Barrett (2003), absorption is also correlated with hallucinatory tendencies that could also account for many ostensibly paranormal encounters. Furthermore, a growing body of evidence (for reviews, see French, 2003; French & Wilson, 2006; French & Stone, 2014) indicates that absorption correlates not only with paranormal belief and reports of subjective paranormal experiences but also with susceptibility to false memories. This raises the possibility that at least some reports of ostensibly paranormal experiences might be based upon false memories of apparent events that in fact never took place at all. Reality monitoring refers to the psychological processes involved in distinguishing between mental events that are internally generated and those that are the result of external events (Johnson & Raye, 1981; Johnson, Hashtroudi, & Lidsay, 1993). It can be seen that absorption is related to reality monitoring in both the perceptual domain (leading to hallucinatory experiences) and the memory domain (leading to false memories).

Believers in the paranormal tend to be poorer eyewitnesses in anomalistic contexts than are non-believers and are less able to accurately report important details of anomalous events (e.g., Wiseman & Morris, 1995). In fact, the first ever systematic study of the unreliability of eyewitness testimony was carried out by

Davey in the context of a faked séance (Hodgson & Davey, 1887) and such studies have been repeated more recently (e.g., Wiseman, Greening, & Smith 2003). Amongst other findings, these studies show that believers in the paranormal are more susceptible to the power of suggestion in such contexts than non-believers. For example, they are more likely to report stationary objects as having moved if such a suggestion is made by the 'psychic' (see also, Wiseman & Greening, 2005). It is plausible to argue that absorption plays a dual role in such situations. First, intense attentional focus on only certain aspects of the situation means that the true explanation for an ostensibly paranormal event (e.g., sleight of hand) is missed. Secondly, mental events generated via intense imagination in response to external suggestion are confused with objectively real events. The focus of the current study is solely on the possibility that high absorption may be related to the tendency to miss important aspects of the external environment while concentrating on other aspects.

Interestingly, an early demonstration of IB (although not identified as such) took place in an anomalistic context. Cornell (1960) reports experiments in which he dressed as a ghost in a butter muslin sheet and walked across a cinema screen whilst the audience watched the film. Although in full view for 50 seconds, 32% of the audience did not see the 'apparition'. Ironically, this is one of the few situations one could imagine where IB would make an individual *less* likely to report an ostensibly paranormal event.

In this study, we take measures of both absorption and paranormal belief/experience to see if they predict IB status. We predict that IBs would have higher scores on both absorption and paranormal belief/experience then NIBs.

Method

Participants

A total of 98 participants were tested but 6 were excluded due to IB familiarity and one was excluded for omitting several items on the TAS questionnaire), which left 91 participants (age range 18 to 60; mean age = 21.49 years, SD = 6.12; 74 females) who were included in the analyses.

Stimuli & Materials

Tellegen Absorption Scale (TAS; Tellegen & Atkinson, 1974): The TAS is a 34-item true-false scale measuring openness to experience and cognitive-affective alterations across a range of situations (scores range from 0 to 34). Example items are "Sometimes I feel and experience things as I did when I was a child", "I can be greatly moved by eloquent or poetic language", and "I like to watch cloud shapes change in the sky". The scale has been shown to be reliable and valid. For example, Glicksohn (1991) reported reliability of r=0.80 and Glicksohn and Barrett (2003) reported reliability of .84.

(Modified) Australian Sheep-Goat Scale (ASGS; Thalbourne, 2010)*:* A modified version of the widely used Australian Sheep-Goat Scale was used in this study to measure to measure paranormal belief and experience (available at http://www.wlv.ac.uk/PDF/sas_ASGS.pdf). This modified version had 16 rather than 18 true-false items, scoring one point for every "true" response (the two items

relating to belief in life after death were omitted). Example items are "I have had at least one dream that came true and which (I believe) was not just a coincidence." As this version did not include a "don't know" option for responses, scores could only range between 0 and 16. Although other versions of the ASGS have been shown to be reliable and valid (Thalbourne, 2010) and it seems likely that scores on the current version would correlate highly with the standard 18-item ASGS, no reliability and validity data from previous studies were available for this modified version.

Inattentional Blindness. A computerized IB task very similar to one used by Most et al. (2001; see Simons, 2003) was employed in which black (distractor) and white (target) letters move around the screen, frequently hitting the frame. The video (see Figure 1) began with a still frame for 8 s in which the starting positions of the targets and distractors were displayed.

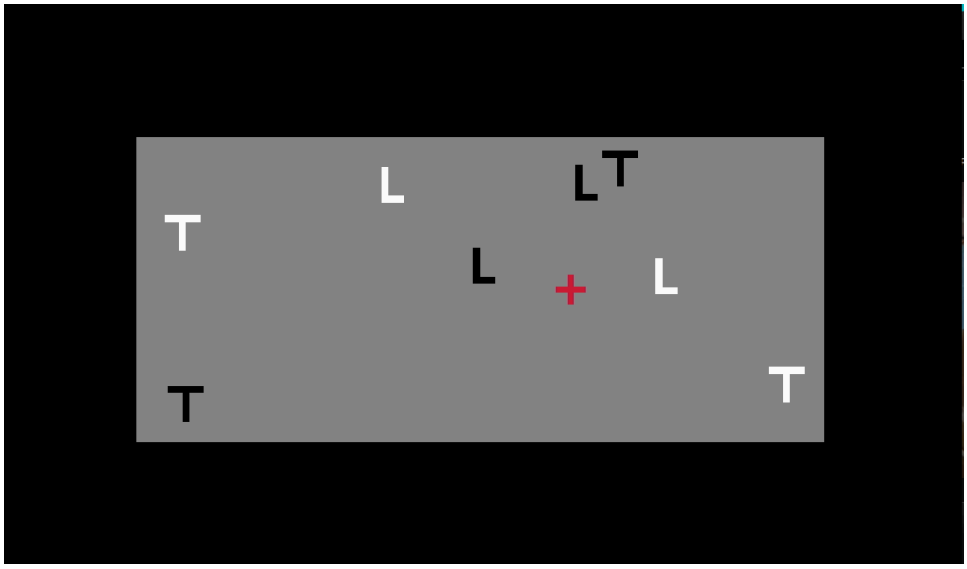

Figure 1. Still frame from the Inattentional blindness video showing the unexpected red cross traversing the screen.

The video began immediately following the still frame and lasted for 25 s. After 7 s of moving letters, a red cross appeared at the right hand side of the display and moved across the centre of the screen to the left hand side, where it disappeared 11 s later. Participants are instructed to ignore the four black letters and to silently count the times the four white letters 'hit' the display frame.

Procedure

Participants were tested individually in a cubicle. They completed the modified-ASGS and TAS followed by the computerized IB task. Participants were instructed to silently count the total number of 'hits' (i.e., the total number of times the white letters hit the frame on the video). At the end of the task, participants were asked how many hits they counted and then asked whether they had seen anything in addition to the white and black letters. Those answering 'no' were classified as IB, and those answering 'yes, a red cross' were classified as NIB. At the end of the study, participants were fully debriefed.

Results

Of the 91 participants, 39 (43%) were inattentionally blind (IB) to the red stimulus whereas the remainder were non-inattentionally blind (NIB). All participants correctly identified the number of hits (plus or minus 2) in the primary IB task.

IBs had higher absorption scores and higher modified-ASGS scores (see Table 1).

	Inattentionally Blind N = 39 (9 males)	**Not Inattentionally Blind N = 52 (8 males)**	***t*(89)**	**CI_{95} (Cohen *d)***
Age	21.59 (3.73)	21.42 (7.46)	0.13	
TAS (Total)	20.23 (4.69)	13.62 (5.25)	6.22**	4.5, 8.7 *(1.34)*
TAS (Paranormal Belief items removed)	18.31 (4.50)	12.40 (4.66)	6.07**	4.0, 7.8 *(1.28)*
Modified ASGS (Paranormal Scale)	5.64 (3.04)	3.46 (2.80)	3.50**	1.0, 3.4 *(0.75)*

Table 1. Characteristics of the Inattentionally Blind and Non-Inattentionally Blind Groups for Study 1 (SDs in parentheses). ** *p=<.001*

These results support both of our hypotheses. A logistic regression analysis was performed with IB (IB coded as 1 and NIB as 0) as the DV and TAS, modified-ASGS scores, age and gender of participant (female coded as 1 and male as 0) as IVs (see Table 2).

Predictor	*β (Se)*	Wald χ^2	*p*	Odds Ratio Exp(B)	95% C.I. for Odds Ratio	
					Lower	**Upper**
TAS (Absorption)	0.24 (0.06)	15.51	<.001	1.27	1.13	1.43
Modified-ASGS (Paranormal Belief)	0.12 (0.09)	1.78	ns	1.13	0.94	1.35
Age	0.03 (0.04)	0.52	ns	1.03	0.95	1.12
Gender	-0.08 (0.70)	0.01	ns	0.93	0.24	3.64

Table 2. Logistic Regression Predicting Inattentional Blindness from Absorption (TAS scale), paranormal Belief (modified-ASGS), Age and Gender.

The overall model was significant (Model = $\chi^2(4) = 34.15$, $p<.001$), but only absorption predicted inattentional blindness. A one-point increase in absorption results in a 1.27 unit change in the odds of being classified as IB. A mediation analysis revealed that the association between paranormal belief and inattentional blindness status was mediated by absorption (Sobel test = 3.45, SE = .01, p <.001) whereas the direct association between absorption and inattentional blindness status was not mediated by paranormal belief (Sobel = 1.26, SE = .004, p=.21).

Finally, there was a significant relationship between paranormal belief (modified ASGS) and absorption (TAS), r = 0.44, p<.001, replicating an association reported by previous investigators using the 18-item version of the ASGS (e.g., French, Santomauro, Hamilton, Fox, & Thalbourne, 2008; Thalbourne, 1998;

Thalbourne, Bartemucci, Delin, Fox, & Nofi, 1997). One concern was that that this correlation may be inflated due to overlapping items in the two scales, with the TAS containing some items that clearly tap into paranormal belief/experience (e.g., "At times I somehow feel the presence of someone who is not physically there."). To address this, the overlapping items were removed from the TAS scores and the analyses performed again. There was no reduction in the prediction of inattentional blindness with the revised absorption scale (Wald statistic = 15.08, Exp(B) = 1.29*).* As expected, none of the other variables were significant predictors (all Wald statistics < 2.64). The revised TAS scale significantly correlated with the modified ASGS (r = 0.40, p<.001).

Discussion

IBs scored higher on absorption than NIBs. Furthermore, IBs had higher paranormal belief/experience scores than NIBs, supporting the suggestion that IB may be a factor in explaining some ostensibly paranormal experiences. However, when both absorption and paranormal belief/experience were entered into the regression, only absorption significantly predicted IB status. In addition, the mediation analysis confirmed an indirect relationship between paranormal belief and inattentional blindness via absorption. As predicted, absorption and paranormal belief/experience were correlated. However, when the items relating to paranormal belief were removed from the TAS, there was no reduction in the predictive power of this construct and paranormal belief did not predict IB status.

These results are important as they are possibly the first to demonstrate a significant association between a personality trait (absorption) and susceptibility to

IB. To check the replicability of these findings using the standard ASGS form, a second study was undertaken. Furthermore, Study 2 examined a possible underlying cognitive factor that might lead to both IB and absorption (and, indirectly, to higher levels of paranormal belief/experience).

Research has shown that low working memory capacity (WMC) is associated with IB (Hannon & Richards, 2010; Richards, Hannon, & Derakshan, 2010; Richards, Hannon, & Vitkovitch, 2012; Seegmiller, Watson, & Strayer, 2011). High WMC is associated with enhanced performance on central executive functioning tasks (Conway & Eagle, 1994; Daneman & Carpenter, 1980) and with effectively allocating attentional resources (Bleckley, Durso, Crutchfield, Engle, & Khanna, 2003). There is evidence that operation span is highly correlated with measures of fluid intelligence (e.g., Conway et al., 2005; Salthouse & Pink, 2008; Unsworth, Heitz, Schrock, & Engle, 2005). This suggests that individuals with low compared to high WMC need to devote a higher proportion of their cognitive resources to the primary task thus resulting in fewer resources being available to notice task-irrelevant stimuli.

Study 2 was a direct replication of Study 1 except that (a) WMC was assessed and (b) the standard 18-item true-false version of the ASGS was used. This version of the ASGS is known to be reliable and valid (Thalbourne, 2010). In addition to the hypotheses of Study 1, it was also hypothesised that IBs and NIBs would differ in terms of WMC. We will examine the relationship between WMC, absorption, and paranormal belief in the context of the "cognitive deficits hypothesis" (Irwin, 2009), i.e., the notion that at least some aspects of paranormal belief/experience can be explained in terms of cognitive deficits on the part of believers.

Study 2

Method

Participants

A total 70 participants were tested but 4 were excluded due to familiarity with IB research, leaving 66 participants (age range 18 to 44; mean age = 23.02; 31 females).

Stimuli & Materials

Materials were identical to those in Study 1 except that (a) the standard 18-item True/don't know/False version of the ASGS was administered (True = 2 points; don't know = 1 point; False = no points) with a theoretical range of scores from zero to 36 and (b) WMC was measured with the widely used Automated Operation Span Task (AOSPAN; Unsworth, Heitz, Schrock, & Engle, 2005).

Automated Operation Span Task (AOSPAN): This task measures working memory capacity (WMC). Participants complete, as quickly as possible, a series of arithmetic problems. Participants solve each problem and then click the mouse. An answer is presented on the screen and the participant decides if the solution is true or false by clicking the appropriate box. Each problem is followed by a letter that is recalled at a later stage. At the end of each trial (comprising between 3 and 7 problems), a 4 x 3 matrix of letters (F, H, J, K, L, N, P, Q, R, S, T, Y) is presented and participants click a box next to the appropriate letter in the exact order that the letters had appeared. Accuracy feedback is given. There are three practice blocks to train the participant and to calculate average solution time for the arithmetic problems. This average time (plus 2.5 SD) is then used as the time limit for the arithmetic portion of the task.

The test phase of the AOSPAN comprised set sizes of 3, 4, 5, 6 and 7 items, each of which were presented 3 times. This gave a total of 75 trials with scores therefore ranging from 0 to 75. The absolute AOSPAN score is calculated by adding the number of items that were reported in the correct order whereas the total score would be how many items were correctly reported without regard to their serial position (e.g., if someone correctly recorded all items in the correct position for all sets except the 3 sets with 7 items, then their score would be 54; if the 7-item sets had been recalled correctly but in the wrong order, then the total score would be 75). This test has been shown to have good test re-test reliability and internal validity (alphas = 0.83 and 0.78, respectively; Unsworth, Heitz, Schrock, & Engle, 2005).

Procedure

The procedure for Study 2 was identical to that for Study 1 except that participants additionally performed the AOSPAN task after completing the TAS and then completed the standard ASGS before performing the IB task.

Results

Of the 66 participants, 32 (48%) were IB to the red stimulus and the remaining participants were NIB. All participants correctly (plus or minus 2) reported the number of target hits in the primary task.

Consistent with Study 1, IBs had higher absorption and higher ASGS scores than the NIBs. However, they had lower AOSPAN (see Table 3).

	Inattentionally Blind N = 32 (14 males)	**Not Inattentionally Blind N = 34 (21 males)**	***t*(64)**	**CI_{95} (Cohen *d*)**
Age	22.63 (4.67)	23.38 (5.04)	0.63	
AOSPAN (Working Memory)	39.50 (10.39)	52.03 (11.67)	4.60**	7.1, 17.97 *(1.13)*
TAS (Absorption)	20.97 (6.69)	14.97 (6.48)	3.70**	2.8, 9.2, 7.8 *(0.83)*
ASGS (Paranormal Belief)	13.09 (6.74)	8.21 (4.85)	3.40**	2.0, 7.8 *(1.34)*

Table 3. Characteristics of the Inattentionally Blind and Non-Inattentionally Blind Groups for Study 2 (SDs in parentheses). ** *p=<.001.*

Both effects reported in Study 1 were replicated and the finding of a significant difference in AOSPAN scores between IBs and NIBs in previous research was confirmed.

As planned, a hierarchical logistic regression analysis with IB as the DV and TAS, ASGS and AOSPAN as IVs was performed. To confirm the findings in Study 1, TAS was entered on the first step and ASGS and AOSPAN added on the second step (see Table 4).

Predictor	*β (Se)*	Wald χ^2	*p*	Odds Ratio Exp(B)	95% C.I. for Odds Ratio	
Step 1					**Lower**	**Upper**
TAS (Absorption)	0.14 (0.04)	10.00	.002	1.15	1.05	1.23
Step 2						
TAS (Absorption)	0.01 (0.07)	0.43	ns	1.10	0.89	1.15
ASGS (Paranormal Belief)	0.10 (0.07)	1.89	ns	1.11	0.96	1.28
AOSPAN (Working Memory)	-0.09 (0.03)	7.86	.005	0.91	0.86	0.97

Table 4. Hierarchical Logistic Regression, with Absorption entered on the first step and Paranromal Belief and Absorption added on the second step .

When TAS was entered on its own, it was a significant predictor of IB (Model = $\chi^2(2) = 12.50$, $p<.001$; Wald statistic = 10.00, $p=.004$, $B = -.14$, Exp(B) = 0.87, CI_{95} = 0.80, 0.95). However, when AOSPAN and ASGS were then added the overall model was again significant (Model = $\chi^2(3) = 23.67$, $p<.001$) but only AOSPAN predicted IB status (Wald statistic = 7.86, $p = .005$, $B = -.09$, Exp(B) = 1.09, CI_{95} = 1.03, 1.17) and both TAS and ASGS were non-significant (Wald statistics of 0.04 and 1.89, respectively, *ps*>.16).

A mediation analysis was performed in which the association between paranormal belief and inattentional blindness status was significantly mediated by working memory capacity (Sobel test = 2.04, SE = 0.03, p =.042). In addition, there

was no mediating effect of paranormal belief on the direct predicting effect of working memory capacity on inattentional blindness status (Sobel test = -1.66, SE = 0.01, *p*=.10). Likewise, working memory capacity mediated the relationship between absorption and inattentional blindness (Sobel test = 2.33, SE = .03, *p* =.019) but there was no converse mediation by absorption on the direct effect of working memory capacity on inattentional blindness status (Sobel test = -1.55, SE = 0.01, *p*=.12).

Finally, significant correlations were found between paranormal belief and absorption (*r* = .74, *p*<.001), between absorption and AOSPAN (*r* = -.41, *p*<.001), and between paranormal belief and AOSPAN (r = -.32, p=.008).

Discussion

The incidence of IB was comparable to that of Study 1. Consistent with Study 1, IBs had stronger paranormal belief and higher absorption scores than NIBs. There was also an inverse relationship between paranormal belief and WMC, suggesting that paranormal belief is associated with a reduction in working memory resources relative to the participant with higher working memory resources in the sample. Although absorption predicted IB when entered into the logistic regression alone, WMC underlies this relationship with absorption failing to contribute significantly to the prediction when WMC is included.

The working memory capacity scores for the IBs and NIBs are similar to those produced in similar studies (e.g., Richards, Hannon, & Derakshan, 2010, with AOSPAN scores of 44.68 and 55.41 for IBs and NIBs respectively (N=82)). In addition, the mean AOSPAN score for the IB group is smaller than the mean AOSPAN

score in many published studies. For example, Shelton, Elliott, Hill, Calamia, and Gouvier (2009) reported an average AOSPAN score of 44.15 (N = 174, SD = 15.54) and Sanbonmatsu, Strayer, Medeiros-Ward, and Watson (2013) reported a mean of 44 (N=277, SD = 16). Our IB participants had significantly lower AOSPAN scores than Shelton et al. (*t-difference* = -2.13, mean difference = -4.65, CI_{95} = -9.30, 0.01) and Sanbonmatsu et al. (*t-difference* = -2.17, mean difference = -4.50, CI_{95} = -8.93, -0.37). Conversely, the average AOSPAN score for our NIB group (52.03) was significantly higher than the mean reported by both Shelton et al. (*t-difference* = 3.39, mean difference = 7.88, CI_{95} = 3.33, 12.43) and Sanbonmatsu et al. (*t-difference* = 3.62, mean difference = 8.03, CI_{95} = 3.68, 12.38). These comparisons suggest that performance on the AOSPAN for the IB group was significantly lower than average and is indicative of a cognitive deficit explanation of inattentional blindness and, indirectly, of paranormal belief. However, it should be noted that the mean AOSPAN scores for the IB group was not lower than the mean of 39.16 (N = 252) as reported by Unsworth, Heitz, Schrock and Engle (2005).

Working memory capacity appears to be associated with inattentional blindness but it is clear from other studies that there are additional factors at work. For example, people with high working memory capacity may be inattentionally blind and this cannot be explained by a reduction in working memory resources. One possibility is that the status of the unexpected stimulus in the standard inattentional blindness task is ambiguous and it is not clear whether the more efficient performer should process it and remember it or process it and forget it. Some of our recent work has manipulated the relevancy of the unexpected change

and shown that when the unexpected change is relevant to the task then people with high working memory capacity are more likely to report having seen it whereas when the unexpected change is irrelevant to the goal of the task, individuals with high working memory are actually *less likely* to report having noticed it (Richards, Hannon, Iqbal Vohra, & Golan, 2013).

Given the facts that susceptibility to IB has been shown to be related to WMC in this and several previous studies (e.g., Hannon & Richards, 2010; Richards et al., 2010, 2012; Seegmiller et al., 2011) and that WMC is highly correlated with fluid intelligence (e.g., Conway et al., 2005; Salthouse & Pink, 2008; Unsworth et al., 2005), it would be interesting in future IB studies to include direct measures of fluid intelligence. Furthermore, this pattern of findings might suggest that paranormal belief/experience is strongly related to fluid intelligence. Although a few studies (e.g., Musch & Ehrenberg, 2002; Smith, Foster, & Stovin, 1998) have reported results consistent with this possibility, other studies have failed to do so (e.g., Jones, Russell, & Nickel, 1977; Stuart-Hamilton, Nayak, & Priest, 2006). In general, it appears that there is at present little strong support for such a direct link between intelligence and paranormal belief (French & Stone, 2014; Irwin, 2009) although there is a paucity of research into this basic issue.

There are, of course, inherent limitations in correlational research, as it is not possible to determine causality. In the current research, we have measured personality traits and cognitive performance without any attempt at manipulation. This restricts the conclusions that can be drawn and it is thus not possible to

definitively conclude that having a low working memory score leads to either inattentional blindness or, indirectly, to a propensity to believe in paranormal phenomenon. Having said that, such an account is inherently plausible

General Discussion

In two studies, higher absorption and paranormal belief were associated with the failure to notice an unexpected stimulus appearing in the visual field. Both studies showed that absorption was important in predicting IB, suggesting that the effect is replicable. The IBs scored more highly than NIBs on paranormal belief/experience, supporting the suggestion that IB may sometimes be a factor in reports of ostensibly paranormal experiences. The reported findings are particularly noteworthy as they are arguably the first to demonstrate a link between susceptibility to IB and a personality variable (i.e., absorption).

Study 2 confirmed and extended the findings of Study 1 and confirmed previous findings (Hannon & Richards, 2010; Richards et al., 2010, 2012) indicating that low WMC is a determining factor in producing IB. We have demonstrated that although belief in the paranormal is associated with high absorption, there is an underlying cognitive deficit in WMC. Low WMC may render the individual effectively blind to events that are causally related to an ostensibly paranormal encounter because only a limited amount of information from the environment is attended to and fully processed. The failure to perceive and remember causally connecting events, such as someone moving an object from one location to another, may encourage a paranormal interpretation. Alternatively, absorption may be

linked to paranormal belief and reports of ostensibly paranormal experiences via other routes, such as the association between absorption and hallucinatory tendencies on the one hand and that between absorption and susceptibility to false memories on the other. Future research should attempt to distinguish between these various possibilities.

The present research did not record race and ethnicity data, and therefore the generalizability of the current findings are somewhat limited. Future research should ensure that full demographic details are recorded. In addition, the current research is limited by the possible influence of contextual factors. The questionnaires were administered together in one experimental session, which increases the possibility of inflating the correlations between the various measures (Council, 1993; Council, Kirsch, & Hainer, 1986). These potential context effects should be avoided in future research by administering the key questionnaires in independent experimental contexts. This procedure would reduce the likelihood that participants will become aware of the possible connections between the different measures. The current research should be performed under conditions where context effects have been controlled to assess the generalizability of the findings.

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All authors developed the studies, designed the experiments and analysed the data. A.R. and C.C.F. wrote the article. M.G.H. collected data. All authors approved the final version of manuscript for submission.

Notes

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