Effect of religious context on the content of visual false perceptions in individuals high in religiosity

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Short title: Religiosity and false perceptions.

Abstract

This study investigated the interaction between the current environment and personality factors associated with religiosity in determining the content of false perceptions (used as a model for hallucinations). A primed word-detection task was used to investigate the effect of a 'religious' context on false perceptions in individuals scoring highly on religiosity. After a subliminal prime, participants viewed letter strings, and stated any words that they saw. The prime and the actual words could have a religious connotation or not. Participants measuring high on religiosity were more likely to report false perceptions of a religious type than participants low on religiosity. It is suggested that context affects the content of false perceptions through the activation of stored beliefs and values, which vary between individuals, offering a mechanism for the effect of context on idiosyncratic content of hallucinations in schizophrenia. The effect of context and individual differences on false-perception content in the current study provides possibilities for future work regarding the underlying nature of hallucinations and their treatment.

Keywords: false perceptions, religiosity, context, priming, hallucination model.

1. **Introduction**

Hallucinatory content is a clinically significant, but relatively little researched area (e.g., Slade and Bentall, 1988). The factors that affect hallucinatory content have been found to vary considerably from individual to individual, making experimental investigation of this area difficult (see Hamilton, 1984; Skirrow et al., 2002). Hallucinations are defined as a perceptual experience in the absence of an external stimulus (APA, 2000), and affect a range of senses, including gustatory, tactile, visual, and auditory (Allen et al., 2008). Although they are considered a hallmark symptom for schizophrenia (Sartorius et al., 1974; Crow, 1980), hallucinations also occur in a wide range of other conditions, including Borderline Personality Disorder (Gunderson et al., 1995), and conditions not linked with psychosis, such as Guillain–Barré Syndrome (Cochen et al., 2005), and Lewy Body Dementia (Harding et al., 2002). In fact, hallucinations have been estimated to occur in 30-40% of the non-clinical population (e.g., Barrett and Etheridge, 1992; Cella et al., 2007), and were reported to be experienced by around 70% of students without a history of psychosis (Posey and Losch, 1983).

Studies that have assessed factors related to the differing content of hallucinations also have focused on the role of individual differences (e.g., Al-Issa, 1977; Kent and Wahass, 1996; Tsakanikos and Reed, 2005; Cella et al., 2007). There are numerous demonstrations that individuals scoring high on psychometrically-measured schizotypy demonstrate higher levels of non-veridical perceptions (in many of these cases, false perceptions in non-clinical populations, rather than full blown clinically-significant hallucinations, have been employed as a model for the latter phenomena) than those scoring low on these scales (Tsakanikos and Reed, 2005; Cella et al., 2007; Reed et al., 2007). However, this personality trait, in itself, does not necessarily relate to specific idiosyncratic content of false perceptions (hallucinations), and may not be helpful in examining hallucination content. In contrast, there are other dimensions of personality which may provide a stronger link to exact nature of the

false perception or the hallucination content, such as a person's religiosity (see Gearing et al., 2011, for a review). There is an association between high religiosity and clinical conditions in which hallucinations occur, such as schizophrenia (Huang et al., 2011) and higher levels of schizotypy (Diduca and Joseph, 1997). Moreover, religious themes have a strong representation in reports concerning the content of hallucinations (see Gearings et al., 2011; Huang et al., 2011). However, there are few studies which have investigated the relationship between high religiosity and levels of false perceptions, and those that have been conducted have produced somewhat inconsistent results. For example, Peters et al. (1999) found that those individuals with higher levels of personal religiosity tended to experience hallucinations at a similar rate to psychotic individuals, and at a higher rate than control subjects. In contrast, Davies et al. (2001) found a smaller effect, in that individuals with high religiosity did not display high rates of hallucinations, compared to those with a psychosis, although the former individuals did experience hallucinations at a greater rate than the controls.

One factor that may account for differences in hallucinatory content is the interaction between these individual differences and the environmental context at the time of the hallucination. For example, Skirrow et al. (2002) studied the effect of context on the content of hallucinations using media reports and patients in an Intensive Care Unit. Those individuals who experienced hallucinations, reported more content regarding themes of war, or the military, when media coverage of these topics was high. Similarly, using a non-clinical population, and measuring levels of schizotypy, Randell et al. (2011) assessed the effect of immediate context on the content of falsely perceived auditory stimuli (used as a model for hallucinations). Participants were played auditory tapes of white noise with words embedded in the recording, and had to report any words that they heard. They were also placed in conditions containing either 'high-imagery' or 'low-imagery' words, and the content of any false perceptions was analyzed. Participants scoring high on schizotypy reported more false

perceptions, and tended to have context-congruent false perceptions, although this was not a pronounced effect using this procedure. Thus, there is some laboratory-based evidence to suggest personality characteristics may interact with the environment to determine the themes of experienced false perceptions (hallucinations). In the current case, it may be that those individuals with high personal religiosity may be more sensitive to religious contexts, and, in these circumstances, may tend to report more false perceptions with a religious content than those individuals with lower personal religiosity.

To investigate this possibility, the present study employed the word detection task, developed by Tsakanikos and Reed (2005; see also Cella et al., 2007; Reed et al., 2008) for the study of false visual perceptions. In this task, participants are asked to identify words in a fast-moving display containing words and letter-strings, and the call out any words that they see. False perceptions are defined as the participant calling out a word that is not presented on that display. To determine if the content of falsely perceived words was more typically religious in those scoring highly on religiosity, when the context was religious, this procedure was adapted in two ways to generate a 'religious' context. Firstly, the actual words employed had a religious theme. Secondly, a priming technique, previously used to demonstrate a powerful effect of immediate context on cognition and behavior (see Bargh et al., 1996; Kawakami et al., 2003; Nelson and Norton, 2005; Johnson et al., 2010), was used. Studies by Johnson et al. (2010; see also Pichon et al, 2007) have noted an effect of subliminal priming using Christian religious words by using this paradigm. If the context and the individual religiosity of the participants are jointly responsible for hallucinatory content, it would be expected that those individuals scoring high in religiosity would display more false perceptions of a religious nature in this religious context than those individuals scoring low on this dimension.

2. Method

2.1 Participants

One hundred participants (31 male, 69 female), with a mean age of 29 (range = 18-55) years were recruited. Participants were volunteers, and did not receive payment in return for participation in the study. None of the participants reported any history of mental illness.

2.2 Materials

2.2.1 *Francis Scale of Attitude Towards Christianity – Adult (Francis and Stubs, 1987)* assesses attitude towards Christianity (chosen as the dominant religion of the area in which the study was conducted). The questionnaire consists of 24 statements concerning: God, Jesus, the Bible, prayer, and Church, to which the participant responds on a 1 to 4 Likert scale, for example: "Prayer helps me a lot": '1' – not at all, '2' – somewhat, '3' – moderately so, '4' – very much so. The questionnaire is scored by adding each number the participant has circled on the scale, with higher overall scores representing higher religiosity. Some items are reverse scored. The adult version has good internal reliability (Cronbach α) of 0.97, and empirical results regarding theoretical predictions about variations in attitude supporting the construct validity of the scale.

2.2.2 *The Oxford-Liverpool Inventory of Feelings and Experiences - Brief (OLIFE-B; Mason and Claridge, 2006)* is designed to assess schizotypy in non-clinical samples, and consists of four sub-scales: Unusual Experiences (UE) – containing items assessing abnormal perceptions, hallucinations, and magical thinking; Cognitive Disorganisation (CD) – assesses attention, concentration, decision-making, and social anxiety, reflecting the disorganised thought aspects of schizotypy; Introvertive Anhedonia (IA) – contains items assessing the avoidance of intimacy, and a lack of enjoyment from social or physical pleasure; and

Impulsive Nonconformity (IN) – contains items assessing anti-social and impulsive behaviour. The Brief Version consists of 43 items, with the participant responding 'yes' or 'no' to questions such as: 'Does a passing thought ever seem so real it frightens you?'. Each affirmative answer is attributed one point, with each negative answer scoring zero points, and some items reverse scored. Mason and Claridge (2006) advise against combining scales to make one composite score, instead using each for separate analyses. It has internal reliability (Cronbach α) of between 0.62 and 0.80, and a concurrent validity of between 0.9 and 0.94 (UE α = 0.8, validity = 0.94; CD, α = 0.77, validity = 0.93; IA, α = 0.62, validity = 0.91; IN, α = 0.63, validity = 0.9).

2.2.3 ***Beck Depression Inventory (BDI; Beck et al, 1961)*** consists of 21 items designed to assess the presence and intensity of depression. Each item refers to a particular symptom of depression, with a four point rating scale and corresponding statement, increasing in severity. For example '0' – I do not feel sad, '1' – I feel sad, '2' – I am sad all the time and can't snap out of it, '3' – I am so sad or unhappy that I can't stand it. The BDI has an internal reliability (Cronbach α) of between 0.73 and 0.92, and concurrent validity of between 0.55 and 0.73, for non-clinical samples (Beck et al., 1988).

2.2.4 ***The State-Trait Anxiety Inventory (STAI; Spielberger et al., 1970)*** is designed to measure anxiety, and consists of two sub-scales measuring state and trait anxiety. The trait anxiety scale assesses long term personality trait or disposition to feeling anxious. The questionnaire consists of 40 overall questions rated using a Likert scale (Spielberger et al., 1970). Twenty items on the state sub-scale assess symptoms of anxiety that the individual may feel in the present moment, for example: "I feel nervous": '1' – Not at all, '2' – Somewhat. '3' – Moderately so, '4' – Very much so. The 20 items on the trait sub-scale

assess symptoms of anxiety that the individual may feel generally during their life, with a corresponding appropriate scale, for example: "I feel nervous and restless" – '1' – Almost never, '2' – Sometimes, '3' – Often, '4' – Almost always. Participants score between 20-80 on each sub-scale, with some items relating to the absence of anxiety reverse scored; higher scores indicate greater anxiety. The STAI has concurrent validity of 0.52 to 0.80, and internal reliability (Cronbach α) of 0.93. The trait anxiety sub-scale has also been found to have high test-retest reliability, with scores remaining at similar levels across testing periods (Rule and Traver, 1983).

2.3 False Perception Task

The word detection task was created using E-Prime E-Studio, and was presented on a Samsung R55 laptop. After instructions, the sequence of the task appeared as follows: blank screen, prime pre-mask, prime, prime post-mask, word detection slide, and then an inter-slide interval. This 'trial' sequence was then repeated 96 times. All slides were presented at a rate of 59.95Hz, with a screen resolution of 800x600.

2.3.1 *Priming*: The priming sequence was based on a study of religious priming by Johnson et al. (2010). Priming words were presented in upper case, white font, on a black background, and were presented on the screen for 35ms. Prior to each prime word, there was a pre-mask, consisting of 10 crosses, presented for 70ms. An identical post-mask was presented for 70ms following presentation of the prime. The priming words used for the religious context were: gospel, heaven, jesus, messiah, prayer, sermon, bible, faith, christ, and church. None of the priming words appeared in the word detection slides as real words. The priming stimulus used for the neutral context was a five letter string comprising a non-word. The series of priming words was repeated five times throughout each experiment; therefore, a priming

word did not appear prior to every word detection slide. Each priming word appeared once, randomly, within a sequence of 20 word detection slides. Apart from an attempt to generate a religious context, the priming manipulation played no role in the experimental design.

2.3.2 *Word Detection Task*: Each word detection slide consisted of four pink discs, one in each quadrant of the screen, with five black capital letters inside each disc. When participants saw each word detection slide, they were instructed to say out loud any word that they thought they had seen in any of the four discs. If they did not see a word, they were instructed to say nothing. In total, there were 96 trials, with 48 containing one real word in one of the four discs. There were 24 words used (each word was used twice). The five letters strings were irregular non-words, and the words used were all one standard deviation above or below the average of the used words in frequency using a logarithmic combine measure of the English frequency vocabulary (Zeno et al., 1995). The other 48 slides contained only letter strings and no real words. The real-word and non-word slides were presented in a random order. While every participant saw the same real words, their order of presentation varied, so that they appeared on different slides, and in a different positions on the screen. In the religious contexts, the religious words presented were: grace, mercy, altar, satan, union, creed, cults, cross, demon, angel, devil, moses, dogma, ghost, glory, birth, pagan, saint, wicca, deity, saved, unity, moral, wrath. The word detection slides were presented for 0.6s (see Reed et al., 2008), and a blank screen followed each word detection slide for 2s. Prior to the task, instructions were presented on the screen in black writing on a white background, and participants completed a practice session consisting of eight word detection slides, with four priming words.

2.4 **Procedure**

Participants were randomly assigned to either the religious or neutral context, and were tested individually in a quiet room where they received an information sheet detailing the study requirements. Following this, all participants completed a questionnaire pack containing the four measures described above. Participants completed questionnaires by hand, and were not given a time limit. At the time of the word detection task, the experimenter was unaware of the participant's scores.

For the word detection task, participants were informed that they would see four colored discs on the screen, each containing a string of five letters. They were informed that some of these letters would be in a random sequence, whilst others would be a real word. Participants were asked to repeat any real words that they saw on the screen, within a pink disc, clearly out loud, to the experimenter. During the task the experimenter kept a record of any words said by the participant, writing them on a sheet of paper next to the slide number with which they occurred. Where the participant had reported the presence of a word when there was no word presented on the slide, this was recorded as a 'false perception'.

Following completion of the word detection task, participants were given a debrief form, and were given the opportunity to ask questions.

3. **Results**

Table 1 about here

Table 1 shows the means (standard deviations) and Pearson correlations between religiosity, the four dimensions of the OLIFE-B, the BDI, and trait anxiety scores. Religiosity did not significantly correlate with any dimension of the OLIFE-B, although significant

positive correlations were found between all dimensions of the OLIFE-B except for Introvertive Anhedonia and Impulsive Nonconformity.

To examine the impact of religiosity on false perceptions per se, participants were split into high and low scoring groups, according to a median split, for the religiosity scale. A mean split design was used, as opposed to a regression analysis, due to the sample size, and also because it is unclear whether or not any relationship between religiosity and false perceptions would be linear, or a step function. A group design is neutral with regard to this issue, but a regression analysis assumes a linear relationship which is not certain to be obtained between psychometric functions and performance (see Osborne et al., 2008). The number numbers of participants in the high and low religiosity groups, in the two contexts, the mean religiosity scores of the groups, and the numbers of false perceptions and correct word identifications made by the groups, as shown in Table 2.

Table 2 about here

A two-factor between-subject analysis of covariance (ANCOVA) was performed on these data with context (religious versus neutral) and religious group as between-subject factors, and unusual experiences (UE), depression (BDI), and trait anxiety, as covariates. This analysis revealed no statistically significantly significant main effects, or an interaction between the factors, all Fs < 1. Similarly, a two-factor between-subject ANCOVA (context x religiosity) was performed on these data with UE, BDI, and trait anxiety as covariates. This revealed no statistically significant main effects, nor an interaction, all Fs < 1.

The main purpose of the study was to examine the impact of the religious context of the content of the false perceptions reported. In total, 67 participants reported a total of 131 false perceptions (mean = 1.31 $\pm$ 1.31). There were 47 different words reported as false

perceptions (i.e. there were 47 different words seen, some of which were seen more than once, totaling 131). These 67 participants were allocated to high and low religiosity, and high and low UE groups, according to the group mean of those 67 participants. The overall mean of these participants was 59.88 ($\pm$ 24.40). In the religious context group 34 participants reported a false perception, 18 participants were allocated to the high religiosity group (mean = 82.75 $\pm$ 11.28), and 16 were allocated to the low religiosity group (mean = 38.35 $\pm$ 7.52). In the neutral context group, 16 participants were allocated to the high religiosity group (mean = 80.21 $\pm$ 12.56), and 17 were allocated to the low religiosity group (mean = 37.50 $\pm$ 8.24).

To analyze whether the content of these words was of a religious nature, a list of the words, and a five-point rating scale, was sent to 80 individuals, who were students studying at Swansea University. They were asked to rate each word according to how religious they thought it was, and informed that there was no right or wrong answer (see Randell et al., 2011). Thirty responses were returned, and the mean rating for each word was calculated. Ten words had an average rating above 3, and were classed as having a religious content (these words were: trinity, saint, mercy, eulogy, Moses, mortal, cross, creed, deity, and Judas). For each participant who reported a false perception, the percentage of their false perceptions that had religious content was calculated.

Figure 1 about here

Figure 1 shows the percentage of religious false perceptions in each group (i.e. high versus low religiosity). This figure shows that there were a greater percentage of false perceptions with a religious content in the religious context than in the neutral context, and this was a much more pronounced effect for the high religious group compared to the low religious group. A two-factor between-subject ANCOVA (religiosity x context) was

conducted on these data with UE, depression, and anxiety as covariates, was conducted on the percentage of religious false perceptions. This analysis revealed statistically significant main effects of religiosity, $F(1,60) = 15.78$, $p < 0.001$, and context, $F(1,60) = 7.84$, $p < 0.01$, and a statistically significant interaction between these two factors, $F(1,60) = 5.45$, $p < 0.05$. Simple effect analyses for high versus low religiosity for each of the contexts were conducted, which revealed a statistically significant effect of religiosity for the religious context, $F(1,60) = 29.20$, $p < 0.001$, but not for the neutral context, $p > 0.20$.

4. **Discussion**

The current study noted that those scoring highly on a religiosity scale were not more likely to report a false visual perceptions compared to those who scored low on this measure, when schizotypy levels were controlled. However, when the content of these false perceptions was analyzed, it was noted that those scoring high in terms of religiosity produced more false perceptions with a religious content, than those scoring low on this measure in the religious context (but not in a non-religious context). In this, they suggest that the content of false perceptions may be related to the characteristics of the individual and the context in which that individual is placed (see also Skirrow et al., 2002; Randell et al., 2011).

It was hypothesized that a religious environmental context would lead to false perceptions of religious content for those scoring high on religiosity. This prediction was based on previous priming studies that suggested that an individual's context affects the way in which they process stimuli (Phillips and Singer, 1997). The context becomes a framework for processing through which context-relevant information or response to stimuli is facilitated, and context-irrelevant information is suppressed (Phillips and Singer, 1997). Research into priming has focused on the effect that the activation of these stored relationships has on a person's subsequent thoughts and actions, but the current study finds support for the theory

that the activation of beliefs and values through the environmental context also influences the content of the individual's false perceptions. It is possible that the religious context would have activated stored beliefs and values held by the individual, and subsequently when they processed an ambiguous letter string in the contextual framework of 'religion', they would be more likely to perceive a religious word. The finding that religious false perceptions were more likely to occur if the individual measured high on religiosity may be explained as, in order for priming to have an effect, the individual must already hold the relevant beliefs or traits; otherwise there will be nothing to prime (Higgins, 1996). Therefore, it may be that individuals measuring high on religiosity are more likely to be effectively primed, and thus more affected by context, as they will hold more beliefs and values regarding religion.

There are, of course, a number of limitations and caveats that need to be mentioned. It could be argued that individuals high on religiosity were more likely to experience a religious false perception as they may have been exposed to religious words more frequently, or be more aware of more religious words, than those scoring low on this measure, accounting for the difference in false perception content between these two groups. However, this seems unlikely, as there was no difference between the number of real words detected within the study, which were all of a religious nature, by religious and non-religious participants. If religious individuals experienced more religious false perceptions, merely due to knowledge of religious words, then it would be expected that they would also identify a greater number of the real religious words that were present. It should also be mentioned that although the participants reported no history of mental illness, the current study did not attempt to screen this through interview or administration of clinically-validated tools. Although it is unlikely that these participants would have had psychiatric problems such as schizophrenia, and few scored highly on the O-LIFE, or indeed the BDI, scales, it remains a possibility that some participants could have been schizophrenic, and future studies could include a more rigourous

clinical screening programme.

Despite these concerns, the current findings extend previous research into the effect of context on hallucination content. Skirrow et al. (2002) assessed the content of hallucinations in ICU patients, finding that more hallucinations with content relating to war occurred when media coverage of the 1999 war in Kosovo was high. However, Skirrow et al. (2002) did not assess each individual's direct exposure to the media or specific stories regarding the war, and the study was conducted over the period of one year. By directly altering the environmental context of each participant and investigating the resulting false perceptions (as a model for hallucinations), the current study adds to the findings of Skirrow et al. (2002) in support for the role of context in the content of hallucinations, as it can be concluded that each participant was in a religious context, and also supports a role for immediate context as opposed to prolonged context.

In conclusion, the present study found support for the theory that an individual's context does influence the content of their false perceptions, and this influence is greater if the context is personally relevant for that individual. This result extends several previous findings regarding the effect on hallucination/false perception content of a prolonged exposure to a particular context in that the current study shows that an immediate change in the context can also influence false perception content. The main findings regarding the effect of context on the content of false perceptions in a nonclinical population mirror several previous findings obtained from a clinical population, are suggest that this experimental model may be applicable to a clinical population, and could lead to highly beneficial therapeutic interventions for individuals experiencing hallucinations.

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Table 1. **Means (standard deviations) and Pearson correlation matrix of Religiosity (Francis Scale), the four dimensions of the OLIFE-B (Unusual Experiences, Cognitive Disorganization, Introvertive Anhedonia and Impulsive Nonconformity), depression (BDI) and trait anxiety (Speilberger's).**

	Mean (SD)	UE	CD	IA	IN	Dep	Anxiety
Religiosity (Francis)	58.24 (23.54)	-0.10	-0.14	-0.08	-0.22	-0.18	0.14
Unusual Experiences	2.34 (1.9)		0.30*	0.21*	0.33*	0.25	0.12
Cognitive Disorganization	3.60 (2.39)			0.33*	0.57***	0.47***	-0.08
Introverted Anhedonia	1.14 (1.37)				0.11	0.32*	-0.02
Impulsive Nonconformity	2.56 (2.03)					0.42**	-0.22
Depression (BDI)	5.54 (4.80)						-0.05
Trait Anxiety (Speilberger's)	37.16 (10.1)						

$*\ p < .05,\ **\ p < .01,\ ***p < .001$

Table 2. Means (standard deviations) of false perceptions and correct word identifications of the high and low religiosity groups in each context.

Context	Religiosity	N	Francis Scale	False Perceptions	Correct Identifications
Religious	High	22	82.27 (11.85)	1.32 (0.21)	26.91 (1.20)
	Low	28	39.36 (9.05)	1.18 (0.25)	25.18 (1.00)
Neutral	High	22	80.28 (10.95)	1.32 (0.20)	25.95 (1.32)
	Low	28	38.77 (10.03)	1.43 (0.33)	25.43 (0.98)

Figure Captions

Figure 1. Mean percentage of false perceptions which were of religious content, experienced by participants across high and low levels of religiosity.

Figure 1