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Can we ameliorate psychotic symptoms by improving implicit self-esteem? A proof-of-concept experience sampling study of an evaluative classical conditioning intervention

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Abstract

There is a need to develop novel interventions for psychosis, targeted at specific psychological mechanisms. We employed a classical conditioning paradigm to 1) modify implicit self-esteem and 2) examine subsequent effects on subclinical psychotic symptoms measured by the Experience Sampling Methodology. This study is a proof-of-concept pilot investigation conducted with 28 students with high paranoia levels, assessing variations in their self-esteem, paranoid beliefs and subclinical psychotic symptoms daily. After 2 days, participants were randomized to receive either; a positive conditioning task (repeatedly pairing self-relevant words with an image of a smiling face) or a neutral conditioning task (repeatedly pairing self-relevant words with random smiling, angry or neutral faces). After the intervention, the positive conditioning participants showed significantly higher levels of implicit self-esteem and lower subclinical psychotic symptoms than the control condition participants. This study demonstrated that implicit self-esteem can be increased by using a classical conditioning task.

Keywords: psychotic symptoms, paranoid thinking, implicit self-esteem, classical conditioning intervention, experience sample methodology.

1. Introduction

The psychotic symptoms experienced by individuals with schizophrenia spectrum disorders are a source of considerable distress and have a high clinical, personal and social impact. It has been estimated that sustained clinical and social recovery, persisting for at least 2 years, is achieved by as few as 15% individuals with schizophrenia (Jääskeläinen et al., 2013) and the associated UK financial costs exceed £12.5 billion per annum (Fineberg et al., 2013). At present, cognitive behaviour therapy is the most widely delivered psychological treatment for individuals with psychosis, but there has been controversy about the magnitude of the benefits achieved (Wykes et al., 2008; Jauhar et al. 2014). Hence there is a need to explore novel, innovative treatment strategies, targeted at particular psychological mechanisms thought to be important in symptom maintenance.

Self-esteem is one such mechanism. Impaired self-esteem appears to be common in indivisuals with psychosis (Silverstone and Salsali, 2003), is associated with more severe hallucinations and delusions (Smith et al., 2006), and is thought to be a mediating factor explaining the link between critical or over-controlling families and poor outcomes (Barrowclough et al., 2003). Epidemiological evidence suggests that low self-esteem may also be a risk factor for psychosis in the general population (Krabbendam et al., 2002; Kesting and Lincoln, 2013).

Research has especially focused on the role of self-esteem in paranoia. In clinical samples, low (Bentall et al., 2008) and unstable (Thewissen, et al., 2008) self-esteem correlates with the severity of paranoid symptoms, and predicts their persistence over time (Fowler et al., 2012). Hence, current psychological models of paranoia emphasize the role of negative self-schematic processes, although they differ in how

and why these are hypothesized to lead to paranoid thinking (Bentall et al., 2001; Freeman, 2016).

To date, studies of psychosis have mainly focused simply on the level of self-esteem, using explicit measures such as brief questionnaires. Furthermore, cognitive behaviour therapy interventions for psychosis attempt to address self-esteem entirely at this explicit level. However, recent social cognitive research has highlighted an automatic component of self-esteem, dubbed implicit self-esteem, which is conceptualized as a process of self-evaluation that occurs unintentionally and often outside of awareness (Farnham, et al.,1999). In contrast to explicit self-esteem, which is assessed directly by questionnaire, implicit self-esteem is assessed indirectly, for example, by examining automatic associations between ‘‘self’’ and the concepts ‘‘good’’ and “bad” or by assessing evaluative responses to self-relevant stimuli such as letters belonging to the individual’s name (Greenwald and Farnham, 2000; Jones, et al.,2002; Koole, et al., 2001). Implicit and explicit SE are distinct constructs and reflect largely independent domains of functioning (Bosson, et al., 2000; Farnham et al., 1999; Greenwald and Farnham, 2000).

To our knowledge, the only studies of implicit self-esteem in psychosis have focused on paranoid delusions, and the reported findings have been varied (Kesting and Lincoln, 2013). Some studies using the Implicit-Association Test (IAT) have reported low implicit self-esteem in individuals with paranoia compared to healthy controls (McKay, Langdon, Coltheart, 2007; Moritz, Werner, von Collani, 2006) whereas others have reported no differences between the two groups (Kesting et al., 2011; MacKinnon, Newman-Taylor, Stopa, 2011).

Valiente et al (2011) used the affective go/no-go task, a variant of the IAT, and found that paranoid participants associated self-attributed more quickly with negative

then positive attributes, indicating an implicit negative self-bias. As these participants also had normal scores on explicit SE, the findings were interpreted as consistent with the hypothesis that defensive or motivational factors play a role in persecutory delusions (see McKay and Kinsbourne, 2010). Given the inconsistency in the findings overall, studying the effects of manipulating implicit self-esteem on psychotic symptoms has the potential to be informative about both the psychological mechanisms underlying psychosis and also about potential novel avenues of therapeutic intervention.

Presently, the cognitive foundations of implicit self-esteem remain largely unexplored. However, it seems that, whereas explicit attitudes are can be acquired via persuasion, (rational argument and other verbal means), implicit attitudes are constructed primarily by the repeated pairings of potential attitude objects with positive and negative goal-relevant stimuli (Karpinski and Hilton, 2001; Olson and Fazio, 2002; Walther, 2002). Consistent with this account, several studies have demonstrated changes in implicit attitudes resulting from repeated pairings of an attitude object with positive or negative stimuli, a process known as evaluative conditioning (e.g., Baccus, et al., 2004; Dijksterhuis, 2004; Hermans, et al., 2002; Karpinski and Hilton, 2001; Mitchell, et al., 2003; Olson and Fazio, 2001, 2002, 2006; Petty, et al., 2006). Dijksterhuis (2004) demonstrated that subliminal evaluative conditioning of self-related words can change implicit evaluations of the self. Baccus et al. (2004) obtained similar effects with a classical conditioning intervention disguised as a computer game, in which self-related words were paired with positive stimuli (smiling faces), and found that this simple intervention resulted in an immediate increase in implicit self-esteem in a healthy student sample. These findings suggest the possibility that evaluative conditioning might be a useful therapeutic tool in the treatment of individuals with self-esteem related psychopathology.

In the present study, we report a proof-of-concept pilot investigation of this approach using student participants. To assess paranoid beliefs and other psychotic experiences in daily life, we used the Experience Sampling Method (ESM, (Csikszentmihalyi and Larson, 1987) which has previously been used to assess paranoia in clinical samples (e.g Thewissen et al., 2008). This method uses a signal from an electronic device (a portable electronic device) to prompt regular diary entries (10 times a day over 6 days). Half-way through this period, half of our sample (which had been recruited based on their baseline paranoia scores) received a brief evaluative conditioning intervention based on Baccus et al.´s (2004) protocol.

We hypothesized that participants who received the evaluative conditioning intervention would show a significant increase of their levels of implicit SE and a significant reduction in paranoia tendencies when compared with participants who received the control condition. However, given the absence of research on the association between implicit self-esteem and non-paranoid symptoms, we also explored whether evaluative conditioning would affect a more general measure of subclinical psychotic symptoms. However, we expected levels of explicit self-esteem to be unchanged by the intervention.

2. Methods

2.1. Participants

28 undergraduate students from the Complutense University of Madrid (24 women and 4 men) were recruited. Participants were eligible if they scored above 5 on the Persecution Ideation Scale (PIQ; McKay, et al., 2006). This cut-off was selected based on the median score of an earlier unpublished exploratory study by our research team conducted with a larger sample of Spanish undergraduates (N =88). Mean of PIQ scores was 10.04 (±3.31; 6-18).

2.2. Measures

ESM is a structured self-assessment technique used to assess experiences in the flow of daily life. Pre-programmed PSYMATE devices (Myin-Germeys, et al., 2011) were used to administer a structured self-assessment form measuring variations in self-esteem, paranoid thinking and other subclinical psychotic symptoms up to 10 times a day on 6 consecutive days (see. Figure 1). The device prompted participants to complete entries at quasi-random intervals (90 to 180 minutes beep intervals) between 7.30 a.m. and 10.30 p.m. It also included the Name letter task (NLT; Nuttin, 1985, 1987; see below), which was used to measure implicit self-esteem and was administered daily every evening to avoid learning effect and burdening participants. All participants were evaluated with the following ESM measures:

Positive and Negative Explicit Self-Esteem: Consistent with previous ESM studies in non-clinical paranoid-prone samples indicating that positive and negative explicit self-esteem are independent constructs (e.g. Udachina et al., 2009), two items adapted from the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965) were used to assess positive explicit self-esteem ("Right now, I am happy with my self") and negative explicit self-esteem ("Right now, I feel useless"). Both items were rated on 7-point Likert scales (1 = Not at all; 7 = completely). The two were scales correlated r = .2, suggesting that they indeed relatively independent constructs.

Paranoia: Paranoid ideation was defined as the mean score of the following two items adapted from the PIQ to assess momentary paranoid ideation ("Right now, I have the impression that someone is trying to harm me", and "Right now, I have the impression that people are watching me"), both rated on 7-point Likert scales ranging from (1 = "Not at all" to 7 = "Completely"); the scale presented borderline adequate internal consistency, e.e. Cronbach's $\alpha = .59$).

Subclinical Positive Psychotics Symptoms: Consistent with previous ESM studies (Myin-Germeys, et al., 2011) subclinical psychotic symptoms were assessed using the following four items "Since the last beep, I had the impression that normal things seem strange", "Since the last beep, I have had unusual sensory experiences", "Since the last beep, I had the impression that my thoughts could be read" and "Since the last beep, I had the impression that I was being controlled". Items were rated on 7-point Likert scales (1 = Not at all; 7 = completely). Exploratory Factor Analysis revealed a 1-factor solution explaining 61% of the observed variance. The scale presented good internal consistency (Cronbach's $\alpha = .78$).

Implicit Self-Esteem: Several implicit self-esteem measures (see e.g., Bosson, et al., 2000) have been devised, but the two most commonly used measures are the Name-Letter Test measure (NLT; from Nuttin, 1985) and the Self-esteem Implicit Association Test (IAT; Greenwald and Farnham, 2000). We chose to use the NLT because the IAT is similar in appearance and presentation to our evaluative conditioning procedure. The measure was administered once a day, at the final to avoid learning effect and burdening participants.

The NLT relies on how positively the respondents evaluate their initial letters relative to other letters. Respondents are presented with an array of letters, and are asked to rate the likeability of each based on quick gut impressions (e.g., Koole, et al., 2001). The NLT score is typically derived by comparing respondents' evaluations for their initial letters with their evaluations of the rest of the letters in the alphabet (e.g., Kitayama and Karasawa, 1997). The robust tendency for people to rate their initials as more likeable than other letters across different cultures and languages has been documented in numerous studies (e.g., Hoorens, et al., 1990). Evaluations of first and

last initials are usually correlated above .30 (see Bosson et al., 2000), indicating at least a modest degree of internal consistency.

Several different algorithms for computing NLT scores have been proposed. We used the I- algorithm because it has good reliability (see Lebel and Gawronski, 2009). The I- algorithm had a Cronbach's $\alpha = .56$. This algorithm involves ipsatizing letter ratings in two stages (e.g. Baccus et al., 2004). First, the mean rating of all non-initial letters is subtracted from each letter rating. Second, normative letter baselines are computed by averaging the ipsatized letter ratings for individuals whose initials do not include the letter. Finally, a difference score is computed between the ipsatized name letters ratings and the respective baseline scores. This algorithm controls for both baseline levels of attractiveness of the different letters as well as individual differences in baseline response tendencies. We averaged the NLT of pre-measures and post-measures separately.

Insert figure 1

2.3. Procedure

Undergraduate students were recruited to participate in the study after completing the PIQ and signed an informed consent. They were then systematically assigned into two groups, the experimental and control conditions, by order of arrival.

After three days using PSYMATE device, participants received either the experimental or the control version of the conditioning task. Following the classical conditioning intervention of Baccus et al. (2004), the task was tailored for each participant with his or her self-relevant information (e.g., first name, last name, month of birth). The control words were personal pronouns (she/he) and different first and last

names from participant. They were informed that a word would appear randomly in one of the quadrants on the computer screen and they were instructed to click on the word as quickly as possible, using the mouse. Also, they were told that doing so would cause an image to be displayed briefly (for 400 ms) in that quadrant. This procedure was repeated for 240 trials. Self-relevant words and non-self-relevant words were presented in a preprogramed pseudorandom order. In the control condition, once the participant clicked, a random selection of smiling, angry, and neutral photographs of men and women followed both self-relevant (80 trials) and non-self-relevant words. In the experimental condition, self-relevant words were always paired with an image of a smiling face. Nonetheless, all participants received identical numbers of each type of emotional expression.

2.4. Data analyses

Chi-square and independent t-tests were carried out to test for baseline differences between conditions on demographic variables. All ESM data were analyzed using multilevel models with the xtreg module of STATA 12.1. Firstly, pre-intervention scores were examined for any significant differences between conditions by estimating models with Condition (experimental vs control) as a predictor of pre-intervention scores only. Secondly, we tested associations between implicit self-esteem and the two symptom measures during the baseline period. Third, we examined the efficacy of the intervention by estimating models with Timing (pre- vs post- intervention) by Condition interactions as a predictor of implicit self-esteem, positive explicit self-esteem, negative explicit self-esteem, positive psychotic symptoms and paranoia. Any significant interaction effect was then stratified by Condition to test for changes between pre- and post-intervention scores.

3. Results

3.1. Pre-intervention scores

Table 1 shows that there were no significant differences between participants assigned to the experimental condition and control participants on demographic variables. Pre-intervention scores on all ESM variables were comparable across conditions: there were no significant differences between participants assigned to the experimental condition and control participants on implicit self-esteem (B = -.34, SE = .62, p = .58), positive explicit self-esteem (B = .02, SE = .26, p = .91), negative explicit self-esteem (B = .13, SE = .28, p = .64), subclinical positive symptoms (B = .14, SE = .34, p = .68), paranoia ideation (B = - .02, SE = .21, p = .94).

Insert table 1

3.2 Associations between implicit self-esteem and clinical measures at baseline.

Separate multilevel analyses were conducted to determine whether pre-intervention implicit self-esteem scores were associated with momentary symptom measures taken on the same days. It should be noted that, because the ESM diary recorded implicit self-esteem only at the final diary-entry for each day, most symptom measurements did not coincide with the implicit self-esteem measurement. No association was found between implicit self-esteem and paranoia (B = -.01, SE = .05, p = .98) or subclinical positive symptoms (B = -.05, SE = .06, p = .41).

3.3 Effect of the experimental manipulation on implicit and explicit self-esteem:

Table 2 shows the means and standard deviations of psychological variables at baseline and follow-up for the two groups (averaged across the 3 days of baseline and 3 days of follow-up).

For the analyses of daily implicit self-esteem, the significant Timing by Condition interaction (B = .64, SE = .11, p < .001) and follow-up analyses indicated that participants assigned to the experimental condition presented significantly higher implicit self-esteem scores following the intervention (B = .50, SE = .07, p < .001), whereas no significant changes in implicit self-esteem scores were observed in participants assigned to the control condition (B = -.14, SE = .08, p = .10). For the analyses of positive and negative explicit self-esteem scores, the Timing by Condition interactions were not significant (B = .04, SE = .15, p = .81 and B = .01, SE = .12, p = .95 respectively), suggesting that the experimental manipulation had no impact on participants' daily life reports of explicit self-esteem.

Insert table 2

3.4 Effect of the experimental manipulation on subclinical symptoms:

In terms of subclinical positive symptoms, a significant Timing by Condition interaction was found (B = - .30, SE = .07, p < .001). Follow-up analyses revealed a significant amelioration of positive symptoms in individuals assigned to the experimental condition (B = - .24, SE = .05, p < .001), but no change in symptoms was observed in participants assigned to the control condition (B = .05, SE = .04, p = .21). The analyses carried out on ESM paranoia scores, however, were not significant (Timing by Condition interaction: B = - 0.03, SE = 0.10, p = .70).

4. Discussion

The results from this pilot study were mixed. On the one hand, our analyses found that the participants who received the experimental condition showed a significant increase of their levels of implicit self-esteem, and a significant reduction in

their positive symptom scores when compared to the participants in the control condition. However, when we looked specifically at paranoid beliefs, we did not find the expected effect. Nor did we find an effect for explicit self-esteem, but this was expected since the intervention was targeted at the implicit level. The absence of an effect on paranoia was consistent with the lack of association between the paranoia measure and implicit self-esteem at baseline, although this latter observation should be treated with caution because the ESM diary was not well-structured for this comparison. Together these observations cast doubt on whether it is appropriate to interpret the associations between implicit self-esteem and paranoia found in some (McKay, Langdon, Coltheart, 2007; Moritz, et al, 2006; Valiente et al. 2011) but not all (Kesting et al., 2011; MacKinnon, et al, 2011) previous studies as causal. However, the limitations of this proof of concept study discussed below probably prevent a definitive judgment on this issue.

The finding of an effect of evaluative conditioning on implicit self-esteem replicated and extends the findings of Baccus et al. (2004); whereas they detected the effect immediately after the experimental manipulation we found it using momentary assessment over the following two days; this observation that the effect is durable may have important therapeutic implications and needs further exploration. The effect on subclinical positive symptoms was also encouraging, although the lack of an effect on paranoia was disappointing. Aside from content, one difference between the two measures is the time frame within which the symptoms were measured. Whereas the paranoia measure attempted to assess momentary fears of persecution, the psychotic symptom measure asked about experiences “since the last bleep”. In ESM research, each type of question has advantages and disadvantages. Momentary reports are, arguably, more likely to be accurate than retrospective reports; on the other hand,

momentary assessments may miss experiences that are fleeting and fluctuate over time. We chose to use a combination of the two types of items, hoping to maximise our ability to detect effects. It was not possible to establish whether the different results for the two types of items reflected the item-type or the specific symptoms measured, and this will be an important issue to address in future research.

It is also interesting to note that the content of some of these questions concerned feelings of delusional mood ("I had the impression that normal things seem strange") and other experiences which might be judged to be of a paranoid character ("Since the last beep, I had the impression that my thoughts could be read" and "Since the last beep, I had the impression that I was being controlled"). Hence, in future studies, further consideration of the most appropriate assessment questions may be warranted.

The pilot study had a number of other important limitations which may have impeded our ability to detect effects, and which may explain the different results obtained from those studies which have found and association between implicit self-esteem and paranoia (McKay et al. 2007; Moritz et al. 2006; Valiente et al 2011). First, students were selected if they scored above 5 on the PIQ, which was the median score of a larger Spanish undergraduate sample tested by the researchers in an earlier study. Hence, the participants were not scoring particularly highly on our paranoia measure, which had a maximum possible score of 40 (the maximum score in our sample was 18), and this may have constrained the variation of scores within the sample and hence our ability to detect effects both cross sectionally and in response to the intervention. Moreover, for practical reasons, the sample included in the study was quite small. It is possible that different results would have been obtained from a clinical sample with higher levels of paranoia.

Second, the paranoia measure in our ESM questionnaire had marginal reliability (alpha coefficient of .59) and we only used single item explicit self-esteem measures. The paranoia items were taken from the PIQ and were different from paranoia items used in some clinical ESM studies (e.g Thewissen et al. 2008) and the self-esteem items were taken from RSES (Rosenberg, 1965). It was not clear why their reliability of the paranoia measure was lower than expected but this will have limited the potential to detect pre-vs-post changes.

Third, the ESM protocol for implicit SE used only one measurement per day, taken at the end of the day, rather than the more frequent measurements typical of ESM measures. We thought it prudent to limit the number of implicit self-esteem measurements to minimise the very real risk of practice and learning effects. However, there is a risk that measurement at the end of the day may have been affected by diurnal factors. Future studies should consider new implicit methods to be applied by ESM methodology.

4.1. Implications

The study demonstrated a methodology for experimentally investigating experimental psychopathology interventions using experience sampling. Moreover, it also demonstrated that evaluative classical conditioning may be worthy of further investigation as a procedure for changing implicit beliefs about the self or (potentially) other negatively evaluated targets which may play a role in psychological distress. The intervention was very simple and quick from the participant´s viewpoint. Given the limitations of the study already alluded to, the fact that we observed effects for implicit self-esteem and subclinical psychotic symptoms is encouraging.

There is now considerable evidence that human cognition is stratified in to two levels that sustain explicit and implicit judgments (e.g. Reber, 1989; Gawronski and

Boderhausen, 2006; Evans, 2008); it is therefore implausible that the mechanisms of psychopathology operate only at the explicit level. There is therefore a need for further experimental studies of implicit processes in severe mental illness, and investigations of methods of manipulating these processes with the hope of developing a protocol suitable for administering to clinical individuals. In future evaluative conditioning studies, it will be helpful to select participants who meet a higher threshold for paranoia, and to consider a wider range of ESM items. It will be important to consider the extent to which changes in implicit self-esteem are sustainable over time (perhaps with further evaluative conditioning sessions) and whether there is a cumulative effect on explicit self-esteem. Consideration might also be given to using more powerful evaluating conditioning procedures (for example, by repeating the procedure over a number of days) in the hope of more sizeable effects.

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Table 1. Differences in demographic and psychological characteristics among experimental condition and control condition groups

Characteristics	Experimental Condition (n= 14)	Control Condition (n= 14)	X^2	t /B	SE	p
Sex: Women, n (%)	11 (76.9)	13 (92.3)	.27	----	----	ns
Age: mean (SD)	22.5 (1.8)	23.3 (6.8)	----	.43	----	ns
Implicit Self- esteem(SD)	.63 (1.29)	1.02 (1.6)	----	-.34	.62	ns
(range)	(-1.3,2.5)	(-3.1,2.7)				
Positive Self-esteem (SD)	4.96 (.69)	4.87 (.79)	----	.02	.26	ns
(range)	(4,6.3)	(3.2,6.4)				
Negative Self-esteem (SD)	1.74 (.96)	1.61 (.49)	----	.13	.28	ns
(range)	(1,3.88)	(1,2.5)				
Subclinical Psychotic symptoms	1.96 (.86)	1.86 (.67)	----	.14	.34	ns
(SD) (range)	(1.2,4.3)	(1.2,3.9)				
Paranoia ideation (SD)	2.01 (.57)	2.09 (.43)	----	-.02	.21	ns
(range)	(1.16,3.28)	(1.4,3.1)				

*p < .05; **p < .01

Table 2: Means and standard deviation of psychological variables at baseline and follow-up for the two groups (averaged across the 3 days of baseline and 3 days of follow-up)

Variables	**Experimental Condition (n=14)**		**Control Condition (n=14)**	
	Baseline	**Follow up**	**Baseline**	**Follow up**
Implicit SE, Mean (SD)	.63 (1.29)	.72 (1.05)	1.02 (1.6)	.63 (1.2)
(range)	(-1.3,2.5)	(-1.1,2.4)	(-3.1,2.7)	(-2.3,2)
Positive explicit SE, Mean (SD)	4.96 (.69)	4.8 (.70)	4.87 (.79)	4.74 (.70)
(range)	(4,6.3)	(3.6,5.8)	(3.2,6.4)	(4,6)
Negative explicit SE, Mean (SD)	1.74 (.96)	1.64 (.73)	1.61 (.49)	1.56 (.77)
(range)	(1,3.88)	(1,3.3)	(1,2.5)	(1,3.1)
Subclinical psychotic symptoms,	1.96 (.86)	1.90 (.72)	1.86 (.67)	1.79 (.46)
Mean (SD) (range)	(1.2,4.3)	(1.1,3.9)	(1.2,3.9)	(1.3,3.1)
Paranoia levels, Mean (SD)	2.01 (.57)	2.18 (.55)	2.09 (.43)	2.12 (.37)
(range)	(1.16,3.28)	(1.1,3.3)	(1.4,3.1)	(1.6,2.8)

Figure 1: Procedure flow chart of the study.

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