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Clinical and theoretical relevance of responses to analogues of psychotic experiences in people with psychotic experiences with and without a need-for-care: an experimental study

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Abstract

Background. Certain ways of responding to psychotic experiences (PEs) appear more commonly associated with clinical distress (e.g. avoidance) and other ways with benign or positive outcomes (e.g. reappraisal and acceptance). Past research has largely been limited to retrospective self-report. We aimed to compare clinical and non-clinical individuals on experimental analogues of anomalous experiences.

Method. Response styles of two groups with persistent PEs (clinical $n = 84$; non-clinical $n = 92$) and a control group without PEs ($n = 83$) were compared following experimental analogues of thought interference (Cards Task, Telepath) and hearing voices (Virtual Acoustic Space Paradigm).

Results. The non-clinical group with PEs were less likely to endorse unhelpful response styles, such as passive responding or attempts to avoid, suppress, worry about or control mental experiences, compared with the clinical group on all three tasks. The clinical group were more likely to endorse unhelpful response styles compared with controls on two out of three tasks (Cards Task and Telepath). The non-clinical group performed similarly to controls on unhelpful responding across all tasks. There were no group differences for helpful response styles, such as cognitive reappraisal or mindful acceptance of experiences.

Conclusions. In line with cognitive models of psychosis, the findings suggest that the way in which individuals respond to unusual experiences may be an important factor in understanding clinical distress, supporting the therapeutic rationale of targeting potentially unhelpful patterns of response.

Introduction

Cognitive models of psychosis propose that the way in which individuals appraise and respond to anomalous experiences can determine the development and maintenance of distress (Birchwood and Chadwick, 1997; Garety *et al.*, 2001; Morrison, 2001). However, a clear taxonomy of unhelpful or maladaptive responding to psychotic experiences (PEs) has yet to be agreed, reflecting both the heterogeneity of the psychosis phenotype and the context-bound nature of 'responding'.

'Response styles' have often been investigated in the context of voice-hearing and commonly associated with the concept of 'coping', influenced by the transactional stress-coping framework of Lazarus and Folkman (1984). Early influential work identified engagement, resistance and indifference as key styles of responding to voices (Birchwood and Chadwick, 1997), with appraisals and beliefs about voices (particularly relating to perceived power and control) playing a key mediating role. Using Principal Component Analysis (PCA), O'Sullivan (1994) proposed coping factors differing along three dimensions – active *v.* passive, hopeful *v.* despairing, acceptance *v.* rejection. More recently, Tully *et al.* (2017b) have validated a self-report measure of cognitive and behavioural responses to psychosis in a general psychosis sample (i.e. not exclusively voice-hearers) and identified three factors: 'threat monitoring and avoidance', 'conscious self-regulation' and 'social control and reassurance-seeking'. The finding that 'threat monitoring and avoidance' showed an association with symptom severity is consistent with a previously reported association of avoidance with positive and negative symptoms (Depp *et al.*, 2011) as well as the role of avoidance as a key safety-seeking behaviour maintaining persecutory beliefs (Freeman *et al.*, 2001; Freeman *et al.*, 2007). Moritz *et al.* (2016b), using the Maladaptive and Adaptive Coping Styles Scale [MAX (Moritz *et al.*, 2016a)], have also found associations between avoidance and suppression and positive

Table 1. Demographic and clinical data by group

	Clinical (<i>n</i> = 74)	Non-clinical (<i>n</i> = 92)	Controls (<i>n</i> = 83)	Significance tests
London: Bangor	35:39	51:41	43:40	
Female (%)	25 (33.8%)	67 (72.8%)	57 (68.7%)	$\chi^2(2) = 30.1, p < 0.001$
Mean age (range)	43 (20–78)	46 (18–80)	46 (21–76)	$F_{(2,246)} = 1.142, p = .321$
Ethnicity				
White	71.6%	87.0%	90.4%	$\chi^2(2) = 11.2, p = .004$ (white v. BME)
Black	21.6%	6.5%	3.6%	
Dual Heritage	2.7%	3.3%	2.4%	
Asian	2.7%	2.2%	2.4%	
Other	1.4%	1.1%	1.2%	
In education/training/employment	18.9%	69.6%	78.3%	$\chi^2(2) = 65.2, p < 0.001$
Mean IQ (s.d.)	89 ^a (11.7)	105 ^b (14.0)	112 ^c (16.5)	$F_{(2,225.5)} = 54.2, p < 0.001$
Median psychiatric admissions (range)	4 ^d (0–20)	N/A	N/A	
On anti-psychotic medication	89%	N/A	N/A	
Typical	10%			
Atypical	55%			
Clozapine	24%			
>1 antipsychotic	16%			
% maximum daily dose; median (range)	50 (12–100) ^e			
Mean age at start of psychotic experiences (s.d.)	22 (10.8)	15 (12.3)	N/A	$t_{(164)} = 3.8, p < 0.001$ (C > NC)
Lifetime voices	87.8%	77.2%	N/A	$\chi^2(1) = 3.150, p = .08$
SAPS total (Andreasen, 1984b)	26.4 (15.4) ^c	12.2 (7.2) ^c	N/A	*$p < 0.001$
SANS total (Andreasen, 1984a)	20.2 (11.8) ^f	3.0 (3.3) ^g	N/A	*$p < 0.001$
AANEX total current (Brett <i>et al.</i> , 2007)	30.1 (6.2) ^b	28.6 (5.1)	N/A	$t_{(135.0)} = 1.327, p = .19$
AANEX total lifetime (Brett <i>et al.</i> , 2007)	36.6 (6.6) ^c	34.8 (4.9)	N/A	$t_{(130.3)} = 1.935, p = .06$

^aSix missing.^bTwo missing.^cOne participant missing.^dFive missing.^eTen missing.^fSeven missing.^gThree missing.*Mann–Whitney tests (all SAPS and SANS scores). Bold denotes $p < .05$.

symptoms (particularly paranoia) which remain after controlling for depression. Recent work highlights the role of emotion with findings that individuals with a diagnosis of schizophrenia use more maladaptive Cognitive Emotional Regulation Strategies [CERS (O'Driscoll *et al.*, 2014)]; and show specific difficulties in emotion regulation skills (related to awareness, understanding and acceptance), which are proposed to affect regulation of anger, shame, anxiety and sadness (Lincoln *et al.*, 2015).

It should be noted that concepts such as stress, coping and emotional regulation are most relevant within the context of distressing experiences. However, PEs exist on a continuum, with replicated findings of benign or even positive PEs occurring in the general population (de Leede-Smith and Barkus, 2013; Johns *et al.*, 2014; Peters *et al.*, 2016). Accordingly, cognitive models of psychosis predict that clinical and non-clinical groups with PEs will differ in how they respond to their anomalous experiences. One study comparing individuals with PEs with and without 'need-for-care' (Bak *et al.*, 2003) involved individuals

reporting incident PEs recruited through a prospective general population sample. The findings suggested that 'symptomatic coping' (i.e. going along with the content of psychotic symptoms), together with lower perceived control, is more common in the clinical group, while use of active problem solving and higher perceived control is more common in the non-clinical group. More recently, within the psychosis continuum literature, there is emerging evidence from studies, which purposively sample non-clinical individuals with full-blown, persistent PEs but no 'need-for-care'. These individuals, with persistent PEs selected for absence of distress, have been shown to have high levels of psychological and emotional well-being (Brett *et al.*, 2007; Ward *et al.*, 2014; Peters *et al.*, 2016) and represent a unique group of particular importance in identifying adaptive ways of responding to PEs. In early work (Brett *et al.*, 2007), it was found that this non-clinical group was less likely to endorse potentially maladaptive responses to PEs categorised as 'avoidance', 'cognitive control' and 'immersion' relative to a clinical psychosis group. However,

this study, in keeping with much of the literature above, was based on retrospective interviews of participants' experiences, an approach which makes it difficult to exclude the possibility that maladaptive responses simply reflect intrinsically more distressing experiences within the clinical group. One way to tackle this issue is by using an experimental design, presenting task-based analogues of psychotic symptoms, allowing all participants to encounter identical anomalous experiences (Linney and Peters, 2007; Peters *et al.*, 2017; Tully *et al.*, 2017a). This allows response styles (as well as appraisals) to be investigated without the potential confound of differences in the nature of the experiences being responded to, while also counteracting limitations with retrospective report. A pilot study comparing individuals with PEs with and without need-for-care on experimental analogues of thought interference and voice-hearing (Ward *et al.*, 2014) showed that those with 'need-for-care' were more likely to endorse maladaptive responses (notably rumination and distraction) and less likely to employ adaptive (decentring) ways of responding to unusual experiences. These findings now require both replication in a larger, fully powered sample, and the addition of a control group without PEs, to allow any observed group differences between the clinical and non-clinical group to be contextualised, and specifically to determine whether the non-clinical group is performing any differently from controls.

Aims

The current study, using a cross-sectional experimental design, aimed to investigate maladaptive and adaptive responses to three task-based analogues of PEs (thought interference, mind reading and voice-hearing) in a large sample consisting of three groups: people with persistent PEs with and without a need-for-care, and a control group without PEs.

Hypotheses

- (1) The non-clinical group will endorse fewer maladaptive response styles than the clinical group following three experimental symptom analogues, but will not differ from controls.
- (2) The non-clinical group will endorse more adaptive ('decentring') response styles than the clinical group following three experimental symptom analogues but will not differ from controls.

Methods

This was a planned study conducted within the larger UNIQUE study reported elsewhere (Peters *et al.*, 2016; Peters *et al.*, 2017).

Design

The study is a cross-sectional experimental design, comparing three groups on responses to three tasks that induce anomalous experiences.

Participants

Three groups were recruited across two sites (urban – South London; rural – North Wales): (i) patients with PEs and diagnoses F20–F39 (clinical group); (ii) individuals with PEs without need-for-care (non-clinical group); (iii) controls with no PEs, matched to non-clinical group in age, gender, ethnicity and education.

Exclusion (all groups): (i) age <18; (ii) insufficient English; (iii) neurological history, head injury, epilepsy; (iv) primary substance dependence.

Main inclusion criterion for clinical/non-clinical groups was evidence of current PEs (past month/in clear consciousness), scoring ≥ 2 ('occasional') on at least one item of the Scale for the Assessment of Positive Symptoms (SAPS) (Andreasen, 1984b). Specific inclusion criteria for non-clinical group: (i) experiences started ≥ 5 years previously (avoiding possibly prodromal individuals); (ii) did not score 2 ('unmet need') on basic self-care and 'psychological distress' items (relating to PEs) of Camberwell Assessment of Need Short Appraisal Schedule [CANSAS (Slade *et al.*, 1999)]; (iii) no previous contact with mental health services/general practitioner regarding PEs (nor anyone on their behalf); (iv) no previous contact with specialist mental health provision not available through general/family practitioner; (v) judged by research worker to not be in need-of-care for PEs. A specific exclusion criterion for controls was endorsement of any unusual experience item at screening. For additional information on these groups, see Peters *et al.* (2016) and Ward *et al.* (2018).

Measures

Screening

The clinical group were screened through clinician and/or case-note review. The non-clinical and control groups were screened with the Unusual Experiences Screening Questionnaire [UESQ; derived from the AANEX-Inventory (Brett *et al.*, 2007)] and the Psychosis Screening Questionnaire (PSQ) (Bebbington and Nayani, 1995). As well as no endorsement of any item on these measures, controls were required to score below one standard deviation of the mean on the Unusual Experiences (UnEx) subscale (i.e. a cut-off score of 15) of the Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE) (Mason and Claridge, 2006). Detailed information on the screening of participants is provided in Peters *et al.* (2016)

Appraisals of Anomalous Experiences Interview (AANEX) (Brett *et al.*, 2007): The first part of the interview (AANEX-Inventory, short form) (Lovatt *et al.*, 2010) was used, which consists of 17 anomalous experiences (including hearing voices, somatic experiences, experiences of reference and thought/mind permeability) that are rated on a three-point scale (1 = not present; 2 = unclear; 3 = present; potential range of scores 17–51) in the person's lifetime, and currently (within the last month). All inter-rater reliabilities ($N = 35$) indicated almost perfect agreement [Intra-class Correlation Coefficient (ICC) > 0.8]; total number of experiences endorsed (ICC = 0.995); current experiences (ICC = 0.997); lifetime experiences (ICC = 0.998).

Experimental tasks

(a) *Cards Task* (<http://sprott.physics.wisc.edu/pickover/esp2.html>) (Linney and Peters, 2007): This task was used as an 'analogue' of thought interference symptoms. This is a card trick that gives the impression that a computer has been able to read your mind. Participants are shown six playing cards (face cards only) on a computer, from which they are required to inwardly choose and memorise one. They are informed that the card they have chosen will be selected by the computer and removed from the pile. They are then shown five different cards (ensuring that the card they have chosen will be absent) for 3 s. This task relies on the fact that people only scan for the card they have chosen and do not notice that all the cards are different.

Table 2. Group means of adaptive and maladaptive response styles with significance tests, Sidak-adjusted *p*-values (Wright, 1992) and effect sizes

	Clinical (<i>n</i> = 84)	Non-clinical (<i>n</i> = 92)	Con (<i>n</i> = 83)	Significance tests (<i>p</i> Sidak, η_p^2)	Post-hoc (<i>p</i> Sidak)	Cohen's <i>D</i> (95% CI) Cohen (1988)
CT adaptive	5.56 (2.01) ^a	5.99 (1.86)	6.26 (1.88) ^b	$F_{(2,251)} = 2.705, p = .349,$ $\eta_p^2 = .021$		
CT maladaptive	4.99 (1.74) ^a	3.57 (1.58)	3.82 (1.69) ^c	$F_{(2,250)} = 17.209, p < 0.006,$ $\eta_p^2 = 0.121$	C v. NC: <i>p</i> < 0.003 C v. CON: <i>p</i> < 0.003 NC v. CON: 0.934	0.858 (0.545–1.171) 0.683 (0.365–1.001) 0.151 (–0.148 to 0.450)
VASP adaptive	5.92 (2.20) ^d	5.62 (2.10) ^b	5.64 (1.55)	$*F_{(160,3,2)} = .493, p = .997,$ $\eta_p^2 = .005$		
VASP maladaptive	5.49 (1.81) ^d	4.59 (1.73) ^b	4.92 (1.70)	$F_{(2,249)} = 5.667, p = .023,$ $\eta_p^2 = .044$	C v. NC: <i>p</i> = .009 C v. CON: <i>p</i> = .251 NC v. CON: <i>p</i> = .828	0.510 (0.203–0.817) 0.329 (0.018–0.641) 0.188 (–0.11 to 0.486)
TP adaptive	5.62 (2.25) ^e	5.93 (2.22) ^c	6.05 (1.59) ^b	$*F_{(162,6, 2)} = 0.972, p = .943,$ $\eta_p^2 = .007$		
TP maladaptive	5.19 (1.78) ^e	3.32 (1.55) ^e	3.99 (1.76) ^b	$F_{(2,249)} = 26.112, p < 0.006,$ $\eta_p^2 = 0.172$	C v. NC: <i>p</i> < 0.003 C v. CON: <i>p</i> < 0.003 NC v. CON: <i>p</i> = .085	1.12 (0.796–1.443) 0.678 (0.362–0.994) 0.402 (0.099–0.705)

^aFour missing.^bOne missing.^cTwo missing.^dSix missing.^eThree missing.

*Fails test of Homogeneity of variance – Welch's *F* (Welch, 1951) used. All *p* values are Sidak adjusted Wright (1992) for six multiple tests for adaptive and maladaptive response ratings and three for individual group comparisons. CT = Cards Task; VASP = Virtual Acoustic Space Paradigm; TP = Telepath app. Bold denotes *p* < .05 and associated Cohen's *D*.

(*b*) *Telepath phone application* (<http://richardwiseman.wordpress.com/2009/11/24/wanttoreadapersonsmind/>): Like the Cards Task, the telepath task is an analogue of thought interference, specifically 'mindreading' and assesses appraisals of a trick presented on an Apple Iphone application. Four numbers (1–4) are presented on the screen to the participant who is required to choose one number. The phone is then shaken before being placed face down in front of the participant. At this stage, the participant is asked to reveal their choice to the experimenter. Unknown to the participant, shaking the phone activates an animation in the phone, which then cycles through each number with the transition signalled by a sparkle sound of music, enabling the experimenter to keep track. When the phone is turned around by the experimenter, the animation freezes and 'magically' reveals the number chosen by the participant.

(*c*) *Virtual Acoustic Space Paradigm* (Hunter *et al.*, 2003): This task was used as an analogue of voice-hearing (see Ward *et al.*, 2014; Underwood *et al.*, 2016). This paradigm permits sounds to be perceived as externally spatially located through modification of acoustic stimuli, despite presentation via headphones (normally perceived as spatially located 'inside the head'). Participants are told that the task assesses the effects of distraction on performance, and are asked to determine the presence of objects in blurred images while wearing headphones. Throughout the task the participant hears white noise (heard inside the head) with his or her own name (recorded by the research worker before the start of the experiment) followed by the command 'listen up' superimposed at random times (heard outside the head).

Tasks validity

The tasks have demonstrated good face validity in terms of inducing anomalous experiences in previously published studies (Linney and Peters, 2007; Ward *et al.*, 2014; Underwood *et al.*, 2016; Peters *et al.*, 2017). In the current study, tasks were rated

as moderately striking while not being unduly distressing [*N* = 254; Cards Task: mean salience = 4.63 (s.d. = 3.20); distress = 0.66 (s.d. = 1.71); Telepath: salience = 4.49 (s.d. = 3.69); distress = 0.60 (s.d. = 1.55); VASP: salience = 4.09 (s.d. = 3.18); distress = 1.85 (s.d. = 2.81)]. The large majority of participants did not guess the true nature of the tasks (Cards Task: clinical = 95%, non-clinical = 86%, control = 84%; Telepath: clinical = 99%, non-clinical = 93%, control = 95%). This percentage was lower on the VASP (clinical = 86%, non-clinical = 82%, control = 61%), although it was still rated as equally striking, and slightly more distressing, than the other tasks. There were no group differences in percentage correctly guessing on the Cards Task ($\chi^2 = 5.5, df = 2, p = 0.64$) or Telepath ($\chi^2 = 3.2, df = 2, p = 0.21$), but there was on the VASP ($\chi^2 = 16.8, df = 2, p < 0.001$), which was driven by higher rates of correct guesses in the controls compared with both the clinical ($\chi^2 = 13.2, df = 1, p < 0.001$) and non-clinical ($\chi^2 = 9.6, df = 1, p = 0.002$) groups, who did not differ from each other ($\chi^2 = 0.52, df = 1, p = 0.47$).

Assessment of response styles

After each experimental analogue, participants were asked to rate their endorsement of a number of specified response styles on 0–10 Visual Analogue Scales using the same categorisation of response styles as earlier work (Ward *et al.*, 2014). The two adaptive responses captured different methods of 'decentering' either through cognitive reappraisal or mindful acceptance. The maladaptive responses (six items) included three styles: 'active resistance' (avoidance or attempts to control the experience), 'active engagement' (immersion or rumination) and 'passive style' (giving up or reliance on others). Means scores were calculated for the six maladaptive and two adaptive items. This categorisation was developed from the AANEX-CAR (Brett *et al.*, 2007) integrating dimensions of responding noted elsewhere in the literature [e.g. the 'active/passive' and 'acceptance/rejection' dimensions proposed by O'Sullivan (1994) as well as the work of Chadwick

and Birchwood (1994); Birchwood and Chadwick (1997); Farhall and Gehrke (1997)]. See Appendix 1 for details on specific items.

Procedures

Ethical and research governance approvals were given by: National Research Ethics Service Committee London–Westminster (Ref: 12/LO/0766), South London & Maudsley/Institute of Psychiatry Research & Development (R&D) Office (Ref: R&D2012/047) and Betsi Cadwaladr University Health Board R&D Office (Reference: Jackson/LO/0766). Participants were screened over the phone or in person. Eligible participants completed all assessments and were given an honorarium.

Statistical analysis

Analysis was conducted using SPSS (Version 24). Data were first visually inspected (using histograms and scatter plots) to check for normal distributions of response style data. For each task, analysis of variance was then used to compare the three groups on means of maladaptive and adaptive responses. Where the main group effect was significant, post-hoc (Tukey) tests were conducted to test for specific group differences. Sidak-adjusted p -values are presented to account for multiple testing (Wright, 1992). These are calculated as $p_{\text{Sidak}} = 1 - (1 - \text{unadjusted } p)^n$, where n is the number of multiple tests. In order to limit the number of significance tests, the individual response ratings for each task were not analysed separately. Effect sizes (Cohen's d ; Cohen, 1988) with accompanying 95% confidence intervals are reported for post-hoc group comparisons.

A methodological issue that arises when comparing clinical and non-clinical individuals with PEs is the finding that these groups show differences in a range of demographic and clinical variables (Ward *et al.*, 2014; Peters *et al.*, 2016). These are naturally occurring group differences, which include variables that reflect established risk factors for the development of need-for-care, such as low IQ/poorer pre-morbid functioning and ethnicity (Coid *et al.*, 2008; Kirkbride *et al.*, 2012; Kendler *et al.*, 2015) and/or are sequelae of group status (such as impaired functioning, social isolation and anxiety). The view that ANCOVA (analysis of covariance, still commonly employed in psychological research) should be used to achieve the goal of 'controlling for' such real group differences has been condemned (Miller and Chapman, 2001), with the most appropriate use of ANCOVA suggested to be for designs that involve a random allocation of participants to groups. Consistent with earlier studies (Peters *et al.*, 2017; Ward *et al.*, 2018), we therefore report group differences on our hypothesised variables, without including as covariates in the analysis clinical and demographic variables in which the groups naturally differ.

Results

Demographics and clinical data

The groups (clinical group $n = 84$; non-clinical group $n = 92$; controls $n = 83$) did not differ in age. In line with previous research, the non-clinical group was more likely to be female, and non-clinical and control groups were less likely to belong to black or minority ethnic groups, had higher IQ and were more likely to be in education/employment/training. The non-clinical group had a younger age of onset of their PEs than the clinical group,

with 77.2% reporting voices during their lifetime. Overall they were less symptomatic than the clinical group on the SAPS (Andreasen, 1984b) and SANS (Andreasen, 1984a) although not significantly different on the AANEX (Brett *et al.*, 2007), a measure designed to assess anomalous experiences across the psychosis continuum. The non-clinical group experienced hallucinations in all modalities as well as first-rank symptoms, but scored lower on global delusions (with minimal endorsement of paranoid or grandiose delusions). Ideas of reference were the most commonly rated delusion in the non-clinical group, but these were still less common than in the clinical group. The non-clinical group also reported fewer cognitive difficulties and negative symptoms; see Peters *et al.* (2016) for further information and a full discussion of these group differences.

Hypothesis 1: The non-clinical group will endorse fewer maladaptive response styles than the clinical group following three experimental symptom analogues, but will not differ from controls.

As hypothesised, there was a significant association between group and maladaptive responding replicated across the three experimental tasks, which was maintained following statistical adjustment for multiple testing. Post-hoc tests showed that for each task the clinical group scored significantly higher than the non-clinical group for maladaptive responding (large effect sizes on Telepath and Cards Task, medium effect size in VASP) and significantly higher than the control group on the Cards Task and Telepath (medium effect sizes) but not the VASP. There were no significant differences between the non-clinical and control groups on any task after adjusting for multiple testing.

Hypothesis 2: The non-clinical group will endorse more adaptive ('decentring') response styles than the clinical group following three experimental symptom analogues but will not differ from controls.

The non-clinical group did not differ from controls in line with the hypothesis. However, contrary to our hypothesis, there were no significant group differences in adaptive response styles between the non-clinical and clinical groups on any task.

Individual response ratings

Individual response ratings for each task were not subjected to statistical testing (see above) but are presented graphically in Fig. 1 for illustrative purposes. The figure shows a consistent pattern on maladaptive scoring across the three tasks with the non-clinical group tending to score lowest and the clinical group tending to score highest on the majority of maladaptive items. On adaptive items, the pattern is less consistent with the non-clinical group showing higher endorsement than clinical group for reappraisal (as predicted), but the opposite pattern observed for endorsement of mindfulness on two of the three tasks.

Discussion

As predicted, unhelpful ways of responding to PEs differed between non-clinical and clinical groups. These results suggest that maladaptive responding may be an important factor in contributing to developing and maintaining need for clinical care in the context of PEs. Using a novel experimental paradigm,

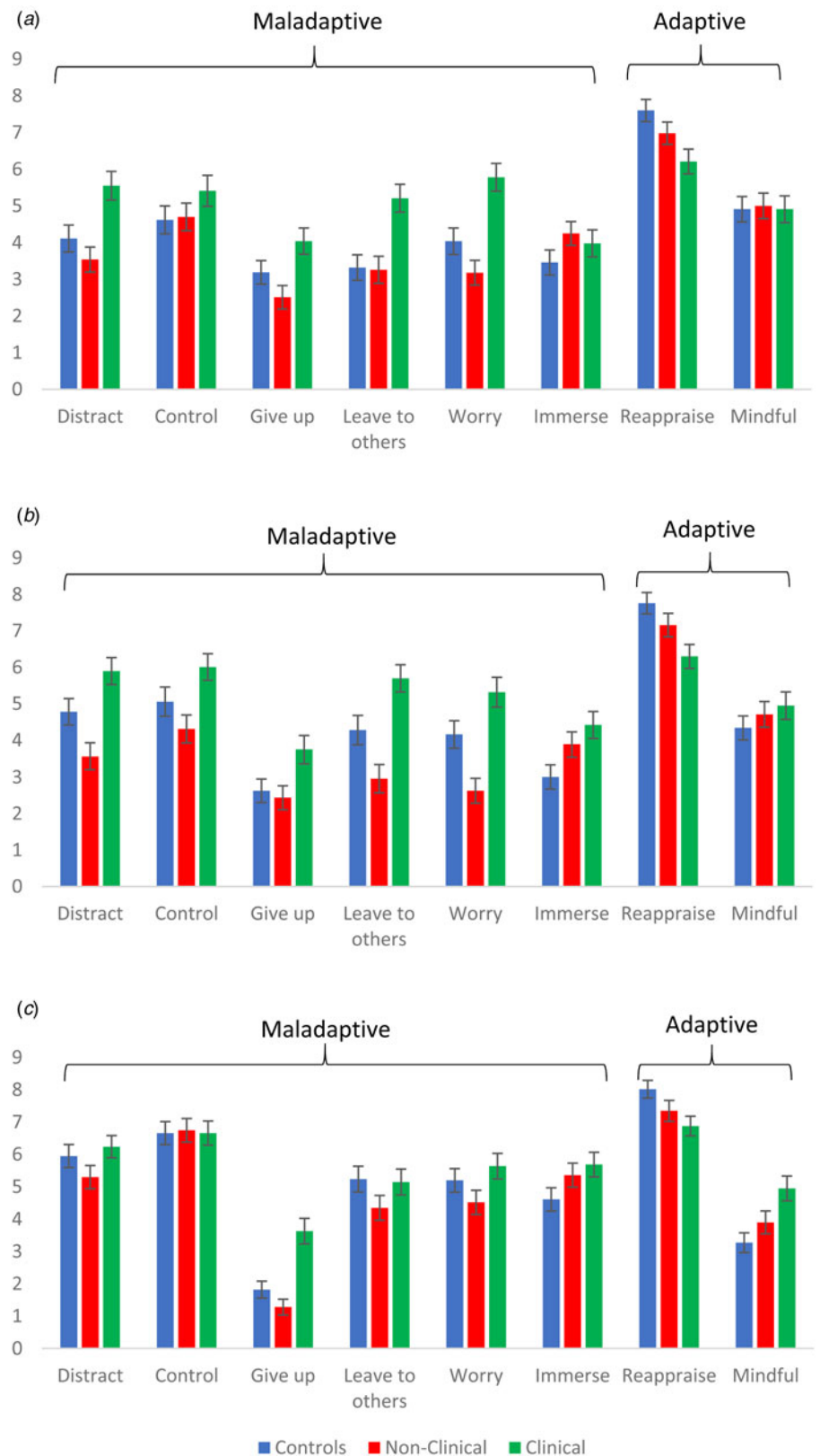


Fig. 1. Pattern of individual responses across each task. Data are means (error bars represent Standard Errors). (a) Cards Task: controls $n=82$; non-clinical $n=92$; clinical $n=80$. (b) Telepath: controls $n=82$; non-clinical $n=90$ ($n=88$ for 'Give up'); clinical $n=81$. (c) VASP: controls $n=83$; non-clinical $n=92$ (91 for 'Distract', 'Worry', 'Immerse', 'Mindful'); clinical $n=78$.

permitting presentation of the same anomalous experiences across groups, we have shown that certain types of responding, including attempts to avoid, suppress, worry about or try to control mental experiences are characteristic of need-for-care and are not a simple consequence of having PEs. Notably, individuals who have PEs

without developing a clinical need show lower rates of these potentially unhelpful response styles, performing similarly to controls with no PEs. However, contrary to hypothesis, group differences were not observed in potentially adaptive 'decentering' responses including cognitive reappraisal and mindfulness.

The main findings are consistent with previous work identifying safety-seeking behaviours, notably avoidance (Freeman *et al.*, 2001; Freeman *et al.*, 2007; Gaynor *et al.*, 2013; Moritz *et al.*, 2016b), worry and rumination (e.g. Vorontsova *et al.*, 2013; Hartley *et al.*, 2014; Freeman *et al.*, 2015) and unhelpful emotional regulation strategies (O'Driscoll *et al.*, 2014) as important processes associated with clinical psychosis. The current study also explored adoption of a passive, 'powerless' stance in the face of ongoing experiences, reflecting the 'social defeat' commonly reported by individuals with psychosis (Birchwood *et al.*, 2000; Birchwood *et al.*, 2004), which has become a key target of relational approaches to voices (Hayward *et al.*, 2017; Craig *et al.*, 2018).

This study was also a novel test of a key tenet of cognitive models of psychosis. These results accord with cognitive models of both voice-hearing (Chadwick and Birchwood, 1994; Birchwood and Chadwick, 1997; Morrison, 2001) and paranoia (Freeman *et al.*, 2002; Freeman, 2016), which propose that such understandable but ultimately unhelpful ways of responding to PEs can maintain distress and therefore represent important treatment targets. Other studies from the larger UNIQUE project have demonstrated significant differences in the appraisals of these same anomalous experiences, specifically, the absence of paranoid and threatening appraisals in the non-clinical group (Peters *et al.*, 2017). Gaynor *et al.* (2013) also demonstrated that the link between safety behaviours and distress in individuals with PEs is mediated by threat appraisals. Results from studies investigating this important non-clinical group who present with PEs in the absence of need-for-care are therefore consistent with the postulated links between appraisal and responding inherent to cognitive models of psychosis. In short, anomalous experiences appraised as threatening may increase the use of safety behaviours (in particular avoidance) in concert with both affective and attentional processes (such as hypervigilance to danger), thereby setting up interactive causal and maintenance processes which form the basis of cognitive formulation and treatment (Morrison, 2001; Freeman *et al.*, 2002; Garety *et al.*, 2007; Freeman, 2016).

Strengths and limitations

A key strength of this study is the comparison of three groups who differ with respect to PEs, and in particular the inclusion of the non-clinical group whose persistent PEs in the absence of distress make them important in terms of identifying factors that may protect against development of 'need-for-care' in the context of PEs. The evidence that this group is less likely to endorse the potentially unhelpful responding that is characteristic of the clinical group is part of an emerging picture of protective factors in this non-clinical group. In addition to the absence of paranoid and threatening appraisals noted above, this group is more likely to report positive social networks and show a preserved ability to engage in slower analytical thinking around their unusual experiences and less tendency to jumping to conclusions (Ward *et al.*, 2018). Protective factors are likely to operate in concert. For example, one could postulate that membership of sub-cultural groups where unusual experiences are validated may be facilitative in developing more flexible processes of appraisal, reasoning and responding, in keeping with the finding that belief flexibility in clinical populations may be associated with the presence of a carer (Jolley *et al.*, 2014).

A second major strength is the experimental design. The use of experimentally controlled experiences counteracts limitations of

retrospective self-report and the potential confound of PEs varying across groups. The large sample of three groups of people, with persistent PEs with and without a need-for-care and a control group without PEs, yields group differences on responding with consistent medium-large effect sizes, which replicate and extend previous work (Ward *et al.*, 2014), and can therefore be considered robust.

With regards to limitations, the cross-sectional design means the possibility cannot be excluded that associations between maladaptive responding and need-for-care may be epiphenomenal to, or a consequence of, need-for-care, or relate only to specific resilience factors on which the groups differ. The anomalous experiences were designed to be deliberately mild in nature. Therefore, the current findings need to be viewed in the context of responses to simulacra of experiences that in daily life typically provoke stronger affective responses. While previous research indicates that maladaptive coping in particular appears closely related to emotion and emotional regulation (see, e.g. O'Driscoll *et al.*, 2014), the role of emotion has not been directly investigated in the current study. Nevertheless, evidence that the same mild experiences can trigger paranoid appraisals and be incorporated into ongoing PEs in clinical individuals (Peters *et al.*, 2017) provides additional evidence for the validity of the tasks.

Any individual response can be viewed as fundamentally context-bound (Aldao, 2013). Response styles characterised as helpful/adaptive and unhelpful/maladaptive may fit more or less well into these categories depending on the specific context. For example, while distraction can form part of a broader picture of unhelpful responding involving avoidance and suppression, it is also a commonly used coping strategy (often advocated by professionals), which can allow the person to engage in positive activities they might otherwise avoid. In addition, while clear differences on maladaptive responding were observed, the expected differences in adaptive responding were not found. Of note here are findings that maladaptive coping may be more stable and less context-dependent than adaptive coping and more strongly related to psychopathology (Aldao and Nolen-Hoeksema, 2010, 2012; Moritz *et al.*, 2016a). The tasks in the current study may therefore be better equipped to tap into more stable maladaptive response orientations with potential differences in adaptive responding better suited to context-bound *in situ* assessment, for example, through use of ESM (Bak *et al.*, 2012; Myin-Germeys *et al.*, 2018). Finally, only two items tapped adaptive responding (cognitive reappraisal and mindful responding) in contrast to six for maladaptive responding. There may have been other important adaptive responses not captured in the current study; of note is the pattern that the non-clinical group consistently showed higher endorsement than the clinical group on cognitive reappraisal but the opposite pattern was seen for two of the tasks for mindfulness, while the adaptive mean showed higher standard deviation than the maladaptive mean.


Theoretical and clinical implications

Cognitive models of psychosis propose that the ways in which individuals appraise and respond to PEs are crucial in the development and maintenance of distress. Evidence of benign (even positive) PEs occurring in the general population indicates that the fact that an experience is psychotic is not sufficient to cause a need-for-care. In addition to the key role ascribed to processes of appraisal and meaning-making, this study provides evidence for the importance of response style in understanding clinical distress, supporting the rationale of targeting unhelpful responding

(encompassing behavioural, attentional, affective and relational processes) in interventions for distressing voices (Thomas *et al.*, 2014) and paranoia (Freeman and Garety, 2014; Freeman, 2016). Clinical formulation needs to strike a balance between the reduction of unhelpful responding and increasing potentially adaptive strategies. Consistent with the current findings, stronger associations with psychopathology have been found for maladaptive compared with adaptive strategies (Aldao and Nolen-Hoeksema, 2010, 2012; Moritz *et al.*, 2016b). It has been argued that reducing maladaptive coping may be more important for outcome than increasing adaptive strategies (Moritz *et al.*, 2016b), although focus and timing of clinical interventions is likely to be crucial.

Future directions

Psychosis is complex, multi-factorial and dynamic (Garety *et al.*, 2007). Having established the key tenets of cognitive models of psychosis regarding the centrality of appraisal and response, the time is ripe to investigate the interactive causal and maintenance processes that by nature vary across individuals, situations and time. Complex inter-relationships between social context, appraisal, reasoning and response will be illuminated by digital technology allowing dynamic real-world assessment and real-time feedback (Reininghaus *et al.*, 2016a, 2016b; Malhi *et al.*, 2017; Rus-Calafell *et al.*, 2018). Questions of causality will be elucidated by a 'causal-interventionist' approach to improving therapy effectiveness, involving tailored interventions to target specific putative causal mechanisms (Freeman, 2011; Mehl *et al.*, 2015; Freeman *et al.*, 2016). Future research will increasingly harness the power of novel statistical techniques such as network analysis (Looijestijn *et al.*, 2015; Isvoranu *et al.*, 2017; Bell and O'Driscoll, 2018). These technological and analytic developments, underpinned by theory, will allow both the refinement of models and the improvement of targeted, individualised psychological treatments for psychosis, supporting individuals to tackle unhelpful patterns of responding and to promote flexible, adaptive alternatives which ultimately improve quality of life.

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Appendix 1

Maladaptive Response styles

- 'Active resistance' – analogous to 'resistance' (Chadwick and Birchwood, 1994) and mirroring 'resistance coping' (Farhall and Gehrke, 1997). Includes:
- Avoidance/distraction
 - 'I would find ways to escape these experiences or take my mind off them'.
 - Attempts to control the experience.
 - 'I would find ways to control these things or stop them from happening'.
- 'Active engagement' – Including:
- Immersion in experience (including active listening and compliance) – seen as analogous to 'engagement' (Chadwick and Birchwood, 1994), overlapping with 'immersion' style (Brett *et al.*, 2007) and 'symptomatic coping' (Bak *et al.*, 2003).

- 'I would listen closely to these voices' (VASP).
 - 'I would try to get into these experiences as much as possible' (Cards Task and Telepath).
 - Rumination (non-decentring) (Brett *et al.*, 2007).
 - 'I would worry about the experiences, running them over and over in my mind, trying to get to the bottom of what they mean' (all tasks).
- 'Passive style' – Including:
- Trusting in external sources (e.g. trusting in God) – this mirrors 'passive coping' (Farhall and Gehrke, 1997) and would correspond to passive, hopeful, acceptance according to the dimensions of (O'Sullivan, 1994).
 - 'I would trust that someone/something would sort this out for me'.
 - 'Giving up' [corresponding to passive, despairing acceptance according to the dimensions of O'Sullivan (1994)].
 - 'I would give up – there is nothing I can do about it'.
- Adaptive Response styles
- 'De-centring style'
- Active acceptance and disengaging (Mindful response style) – overlapping with the 'Neutral response' of Brett *et al.* (2007).
 - 'I would let the experiences come and go without getting involved with them'.
 - Active cognitive reappraisal of experiences ('Appraisal – Decentring') (Brett *et al.*, 2007).
 - 'I would try to think of a sensible explanation of the experiences/find different way of thinking about them'.