



## Predicting changes in delusional ideation: The role of mindfulness and negative schemas

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**Objectives.** Understanding factors that contribute to delusional ideation has important clinical implications. This study looked at the impact of mindfulness and negative schemas on changes in delusional ideation over time.

**Design.** A sample of University students was selected to investigate processes related to delusional ideation in a non-clinical sample.

**Method.** A web-based survey was completed by 700 University students, 204 of whom completed a second identical survey after 6 months, to comprise the longitudinal sample.

**Results.** Results from the study demonstrated that negative schemas and mindfulness were related to changes in delusional ideation over time and support was found for a mediated model, whereby mindfulness mediated the impact of schemas on the outcome.

**Conclusions.** The findings point to the importance of mindfulness as an intervention for preventing non-clinical delusional ideation transitioning into clinical delusions.

Early definitions have described delusions as phenomena that are only experienced by the seriously mentally ill and therefore not subject to normal psychological processes (e.g., Jaspers, 1963). This definition has been forced into reconsideration as evidence has accrued to suggest that delusional thinking lies on a normative curve and also exists in the general population (Johns & van Os, 2001; Romme, Honig, Noorthoorn, & Escher, 1992; van Os, Linscott, Myin-Germeys, Delespaul, & Krabbendam, 2009).

Reports of the prevalence of delusions in the general population vary, ranging from between 0.3% and 20% (Johns *et al.*, 2004; Tien & Anthony, 1990). Variation is likely to be due in part to the particular population surveyed (due to rates of factors such as urbanicity, poverty levels, and immigration rates). However, such findings point towards

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the normative distribution of delusional thinking, where on one end of the continuum lie more severe clinical delusions with a gradual progression towards non-clinical delusions that are similar in content but do not cause as much interference.

Garety and Hemsley (1987) have argued that delusions are difficult to define categorically and are better understood as multidimensional. Peters, Joseph, and Garety (1999) have proposed that the degree to which individuals are preoccupied, distressed, and the amount of conviction held in beliefs should be taken into account in the assessment of delusions. Subsequent studies have supported this proposal, finding that ratings of preoccupation, distress, and conviction better differentiated clinical from non-clinical groups, rather than simply the presence of delusional-type thinking (Peters, Day, McKenna, & Orbach, 1999; Peters, Joseph, Day, & Garety, 2004).

Although from a normative perspective the cut-off between clinical and non-clinical delusions is considered artificial, it has been hypothesized that clinical and non-clinical ideation are related (Krabbendam, Myin-Germeys, Bak, & van Os, 2005). A gradual accumulation of evidence supports this notion. For example, van Os, Hanssen, Bijl, and Ravelli (2000) found that clinical symptoms were strongly associated with non-clinically relevant symptoms, plausible symptoms, and secondary symptoms. Furthermore, they found that the same demographic and clinical risk factors were associated with clinical and non-clinical symptoms. Based on these results, the authors proposed an 'etiologic continuity' hypothesis, arguing that underlying factors present in both groups are responsible for the transition from non-clinical to clinical delusions. A number of studies have reported data to support this view (Freeman *et al.*, 2005; Garety *et al.*, 2005; Krabbendam & van Os, 2005; Van Dael *et al.*, 2006). Longitudinal studies have also indicated that the presence of delusional ideation substantially increases risk for later incidence of psychosis (Chapman, Chapman, Kwapil, Eckblad, & Zinser, 1994; Poulton *et al.*, 2000).

Taken together, this evidence suggests that non-clinical and clinical levels of delusional ideation are of the same form and type, and that non-clinical ideation may be an attenuated precursor to more severe delusions. Better understanding of factors that worsen non-clinical delusional thinking may provide insight into the etiologic underpinnings and developmental processes involved in clinical symptoms. A wide range of factors have been identified as risk factors for psychosis, including environmental factors, such as urban living and unemployment (Kendler, Gallagher, Abelson, & Kessler, 1996), family environment (Bebbington & Kuipers, 1994), and poorer access to health care (Dean, Bramon, & Murray, 2003; Mulvany *et al.*, 2001; Pedersen & Mortensen, 2001). Stressful life events, such as sexual abuse (Janssen *et al.*, 2004), trauma (Kilcommons & Morrison, 2005) and victimization (Bebbington *et al.*, 2004) have also been linked to increased incidence of psychosis.

A number of mechanisms have been proposed that could mediate the impact of these variables on the development of psychotic symptoms such as delusions, one of these being negative schemas.

### **Negative schemas**

Fundamental, underlying negative beliefs or schemas that individuals hold about themselves, others, and the world around them have long been proposed as mechanisms by which past stressors or adverse life circumstance continue to influence and contribute to psychological distress (Beck, 1976; Gilbert, 1992; Young, Klosko, & Weishaar, 2003). Young (1999) elaborated on the concept to specify early developmental experiences that were likely to contribute to negative or maladaptive schemas, also arguing that

such schemas remain highly stable into adulthood. Longitudinal studies have provided support for this, showing relatively high levels of stability in schemas across time (Riso *et al.*, 2006; Wang, Halvorsen, Eisemann, & Waterloo, 2010).

Psychological models of delusions incorporate such negative beliefs, suggesting that schemas can influence processing of information related to a search for meaning of unusual or anomalous experiences (Freeman, 2007; Garety, Kuipers, Fowler, Freeman, & Bebbington, 2001).

Recent research has suggested that negative schemas are important to the formation and maintenance of delusional beliefs. Barrowclough *et al.* (2003) assessed levels of negative self-evaluations in 59 people diagnosed with schizophrenia. Participants were asked to describe negative aspects of themselves, including personal qualities, traits, and personal character deficits. Results indicated that negative self-evaluations were strongly associated with reports of delusions, even after controlling for levels of depression. This finding suggests that these evaluations, which potentially tap underlying core schemas, are important to the development of delusions.

Smith *et al.* (2006) found that delusional thinking was associated with negative self-schemas and other schemas, however, negative other schemas were not significantly associated after controlling for levels of depression and low self-esteem. Furthermore, negative self-schemas were more strongly associated with delusional distress and preoccupation than with conviction associated with the delusional belief.

A further factor through which external risk can impact on psychotic symptomatology is via the individual's relationship with their symptoms. Morrison and colleagues have argued that avoidance and suppression-based coping strategies may serve to exacerbate psychotic symptoms such as intrusive thoughts or hallucinations, suggesting that the individual's response, rather than the symptom itself, is the problematic component (Morrison, 1994; Morrison, Haddock, & Tarrier, 1995). Several studies have found that people with schizophrenia are more likely to engage in withdrawal or avoidance-type strategies (Nicholson & Neufeld, 1992; van den Bosch & Rombouts, 1997). Freeman and Garety (1999) reported that delusional distress was not only related to the content of the delusions, but also associated with the degree to which the individual felt they could control delusion-relevant worries. The practice of mindfulness has been suggested as one way by which an individual may change the way in which they relate to psychotic symptoms (Chadwick, 2006).

### **Mindfulness**

Over the last 10–15 years, mindfulness and acceptance-based approaches have become increasingly prominent in the psychological literature (Hayes, Follette, & Linehan, 2005). Mindfulness can be described as 'paying attention in a particular way: on purpose, in the present moment and non-judgementally' (Kabat-Zinn, 1994, p. 3). Other definitions highlight that mindfulness involves a focusing of attention and an acceptance of present moment experiences (Linehan, 1993). This is in contrast to cognitive processes such as rumination, worry, planning, or automatic engagement with activity without awareness (Baer, Smith, & Allen, 2004).

Interventions that incorporate mindfulness currently include mindfulness-based stress reduction (MBSR; Kabat-Zinn, 1990), mindfulness-based cognitive therapy (MBCT; Segal, Williams, & Teasdale, 2002), dialectical behavioural therapy (DBT; Linehan, 1993), and acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 1999). Collectively, these have been termed 'third wave' cognitive behavioural therapies (Hayes,

2004). An evidence base has developed to indicate that mindfulness and acceptance-based interventions are effective for a wide range of problems, including eating disorders, affective disorders, anxiety, stress, substance misuse problems, and as a complementary treatment for physical disorders (Baer, 2003; Hayes, Luoma, Bond, Masuda, & Lillis, 2006).

Evidence is emerging to suggest that mindfulness interventions may be useful for people with psychosis. Chadwick (2006) has developed a mindfulness-based therapy programme designed for people who experience psychosis with the aim of influencing how people relate to their psychotic experiences. Two small trials have provided some evidence that mindfulness can be helpful with this group of people (Chadwick, Hughes, Russell, Russell, & Dagnan, 2009; Chadwick, Newman-Taylor, & Abba, 2005). Davis, Strassburger, and Brown (2007) conducted an 8-week group-based intervention for anxiety with people who had a diagnosis of psychosis. Feedback from participants was positive, indicating mindfulness had helped with coping and managing stress. Importantly, the intervention was found not to exacerbate clinician-rated psychotic symptoms.

In addition to these findings, there have been two randomized controlled trials that have successfully used ACT protocols (incorporating mindfulness) in treating people with psychosis (Bach & Hayes, 2002; Gaudiano & Herbert, 2006). Both trials reported improvements in symptoms at follow-up and a reduction in rehospitalization rates.

Together, these results suggest that mindfulness strategies may be useful for ameliorating psychotic and delusional thinking. Both negative schemas and mindfulness have been demonstrated to be of importance to the development and maintenance of delusional ideation, but have not yet been studied in relation to non-clinical delusions. Furthermore, neither concept has been studied in relation to each other.

### ***Aims of the present study***

From the literature reviewed above, it is apparent that the study of non-clinical delusional ideation is potentially important in terms of better understanding clinical delusions. There is good evidence to suggest that non-clinical ideation could be a precursor to the onset of clinical symptoms. Understanding factors that cause changes in non-clinical delusions over time is therefore important.

The aims of this study were to investigate the relationships between negative schemas, mindfulness, and delusional ideation over time. A longitudinal design was employed to allow for an investigation of factors that are predictive of change in delusional ideation over time. Because of the lack of previous research investigating the relationship between negative schemas and mindfulness, this study was exploratory in design and aimed to test two different possible pathways of effect: direct effects and mediated effects.

### ***Model 1: Direct, independent effects***

Model 1 posits that mindfulness and negative schemas have separate, independent effects over time on delusional ideation, in that higher levels of each leads to higher levels of delusional ideation.

### ***Model 2: Mediated effects***

Model 2 posits that the effects of negative schemas on delusional ideation over time are mediated by mindfulness. More negative schemas lead to lower mindfulness, which in turn leads to higher levels of delusional ideation over time. Because negative schemas are thought to be formed from early life experiences, it is hypothesized that they would precede the development of mindfulness skills. Based on the recommendation of Peters

*et al.* (1999), it was decided to take a dimensional approach and investigate these pathways on the separate delusional ideation dimensions of preoccupation, distress, and conviction.

## **Method**

### ***Participants and procedure***

Participants were all current university students, recruited from three independent sites. One was a university in London (King's College London); the other two were universities based in New Zealand (the Open Polytechnic of New Zealand and Victoria University, Wellington). The study was web based and participants were invited by e-mail to participate in the study. Those who accepted were taken via a web link to an online version of the questionnaire. All data were collected anonymously so that identification of individual participants was not possible. Two waves of identical surveys were sent out with a time lag of 6 months for both samples. This lag had been chosen both for reasons of practicality but also to allow enough time for significant variation in the variables to occur. To facilitate maximum variation, the second set of measures was administered just before a naturally occurring stressful event (in the case of the target sample, prior to exams). Participants were asked to provide a birth date and an identification code so that surveys could be matched.

### *Time 1 sample characteristics*

A total of 772 people responded initially, however, 72 of these responses were discarded due to incomplete data. This left a total of 700 completed questionnaires. Of these, 386 were from King's College, London, 195 were from the Open Polytechnic of New Zealand, and a further 119 were from Victoria University, Wellington. The mean age of the participants was 28 ( $SD = 10.62$ ) and the majority of participants were female (80%).

### *Time 2 sample characteristics*

At the second time point, a total of 383 completed questionnaires were returned. Of these, 172 were from King's College, London, 110 were from the Open Polytechnic of New Zealand, and a further 101 were from Victoria University, Wellington. The mean age of the participants was again 28 ( $SD = 11.71$ ) and the majority of participants were female (81%).

A total of 204 participants responded to both survey waves so this smaller group constituted the longitudinal sample. The mean age was 28 ( $SD = 11.01$ ) and 81% were female.

As series of independent samples, *t*-tests were carried out to compare the negative schemas, mindfulness, and delusional ideation scores of those participants who responded at Time 1 and Time 2 with those of participants who responded only at Time 1. No significant differences were found, indicating that the scores on the main variables of those who stayed in the study and those who dropped out were not significantly different.

## ***Instruments***

### *Delusional ideation*

The Peters *et al.* Delusion Inventory (PDI; Peters *et al.*, 2004) was used as the measure of delusional ideation. This 21-item scale was designed to measure delusional ideation

in the general population and asks respondents to endorse items regarding potential delusional ideas. An example item is 'Do you ever feel as if there is a conspiracy against you?' In addition, the PDI also assesses current levels of preoccupation, conviction, and distress associated with each endorsed idea. The measure is reported by Peters *et al.* (2004) to have good validity and test-retest reliability. All subscales were found to have the same internal consistency estimate (Cronbach's alpha) of .86 in the Time 1 sample. These estimates are comparable to those found in previous research (e.g., Peters *et al.*, 1999).

#### *Negative schemas*

Negative schemas were assessed using the Brief Core Schema Scale (BCSS; Fowler *et al.*, 2006). The BCSS is a 24-item scale that assesses evaluative beliefs about the self and others. This measure uses a 5-point response scale, ranging from 'disagree' to 'believe it totally'. An example item is, 'I am unloved'. An internal consistency value (Cronbach's alpha) of .92 was obtained in the Time 1 sample. These values are comparable to the BCSS validation study, which also found good validity in relation to other related constructs (Fowler *et al.*, 2006).

#### *Mindfulness*

Mindfulness was measured using the Kentucky Inventory of Mindfulness Skills (KIMS; Baer *et al.*, 2004). The KIMS is a 39-item scale that has been used and validated with a number of clinical samples (e.g., Baum *et al.*, 2010). It is comprised of four subscales: (1) observe: the tendency to notice subtle stimuli in one's environment (e.g., 'I notice the smells and aromas of things'), (2) describe: the ability to describe thoughts and feelings as they occur (e.g., 'I'm good at finding the words to describe my feelings'), (3) act with awareness: the ability to engage with one's current activity with undivided attention (e.g., 'I get completely absorbed in what I'm doing, so that all my attention is focused on it'), and (4) accept without judgement: the tendency to allow experiences to occur without judging them (e.g., 'I tend to evaluate whether my perceptions are right or wrong' [reverse coded]). The measure uses a 5-point response scale ranging from 'never or rarely true' to 'very often or always true'. Internal consistency estimates (Cronbach's alpha) with the Time 1 sample ranged from .95 to .97, indicating excellent internal reliability. These estimates were comparable to those reported by Baer *et al.* (2004).

#### **Statistical analyses**

Latent variable models to test each of the hypotheses were created using AMOS Version 7 (Computer Program, SPSS, Chicago) (Arbuckle, 1994). To control for issues associated with limited sample size relative to the number of total possible model parameters, item-parcelling procedures were used in order to reduce the number of parameters requiring estimation. Following the recommendation of Kishton and Widaman (1994), items were randomly and evenly distributed to parcels. Three five-item parcels were created for the three PDI dimensions (distress, preoccupation, and conviction) and four six-item parcels were created for the BCSS. For each of the KIMS subscales, the items were evenly distributed between three parcels.

Model-fit indices less sensitive to sample size than the chi-square value are reported, that is, the goodness-of-fit index (GFI) and the comparative fit index (CFI), where values

above .95 are indicative of good model fit to data. Estimates of residuals are included, for the standardized root mean square residual (sRMR), values of .08 or less are desirable, and for the root mean square error of approximation (RMSEA), values of .05 or less indicate a close fit of the model to the data (Browne & Cudeck, 1989; Hu & Bentler, 1999).

## Results

The analyses were conducted in two parts. In the first part, cross-sectional analyses were conducted to check that the variables were related to each other in the expected directions. In the second part, the longitudinal direct effects and mediated effects models were tested.

### Cross-sectional findings (Time 1 sample)

#### Correlations among variables

Descriptive statistics and inter-correlations for the study variables are presented in Table 1. As can be seen from Table 1, three of the four mindfulness subscales, 'accept without judgement', 'describe', and 'aware', were correlated with the other variables in the expected direction. The 'accept without judgement' subscale had the strongest and most consistent correlations with negative schemas and the three delusional ideation scales. Interestingly, the fourth subscale, 'observe', was positively correlated with both negative schemas and the delusional ideation scales, contrary to theoretical expectations.

Three cross-sectional models were created to assess the effects of mindfulness and negative schemas independently on the three separate delusional ideation dimensions of distress, preoccupation, and conviction.

#### Delusional ideation distress

In Model 1 the direct, independent effects of negative schemas and the mindfulness subscales on delusional ideation distress were tested. Negative schemas significantly predicted distress ( $\beta = .41$ ;  $p < .001$ ). Of the mindfulness scales, accept without

**Table 1.** Inter-correlation of the variables at Time 1 ( $N = 700$ )

Variable	M	SD	KIM ACCEPT	KIM OBSERVE	KIMS DESCRIBE	KIMS AWARE	BSS	PDI DISTRESS	PDI PREOCC
KIM ACCEPT	29.48	8.32	–						
KIM OBSERVE	36.06	7.62	-.18*	–					
KIMS DESCRIBE	26.69	6.57	.17*	.16*	–				
KIMS AWARE	28.82	5.61	.30*	-.06	.23*	–			
BSS	55.27	13.18	-.49*	.06	-.23*	-.25*	–		
PDI DISTRESS	15.40	11.12	-.46*	.19*	-.11*	-.20*	.45*	–	
PDI PREOCC	15.03	10.96	-.43*	.22*	-.07	-.19*	.39*	.93*	–
PDI CONVIC	18.77	12.57	-.34*	.22*	-.02	-.13*	.29*	.85*	.90*

Note. KIMS, Kentucky Mindfulness Inventory; BSS, Brief Schema Scale; PDI, Peters Delusional Inventory.  
\* $p < .01$ .

judgement ( $\beta = -.21$ ;  $p < .001$ ), observe ( $\beta = .19$ ;  $p < .001$ ), and aware ( $\beta = .12$ ;  $p < .01$ ) all significantly predicted distress, however only accept without judgement predicted in the theoretically expected direction. The mindfulness subscale of describe was not a significant predictor. A total of 31% of the variance in delusional ideation distress was explained.

#### *Delusional ideation preoccupation*

In Model 2, the same variables were used to predict delusional ideation preoccupation. Negative schemas significantly predicted preoccupation ( $\beta = .35$ ;  $p < .01$ ). Accept without judgement ( $\beta = -.20$ ;  $p < .01$ ), observe ( $\beta = .21$ ;  $p < .01$ ), and aware ( $\beta = .09$ ;  $p < .05$ ) all significantly predicted preoccupation. Once again the describe subscale was non-significant and only accept without judgement predicted in the expected direction. A total of 26.5% of the variance in delusional ideation preoccupation was explained.

#### *Delusional ideation conviction*

Model 3 was created to explain variance in delusional ideation conviction. Consistent with Models 1 and 2, negative schemas were found to significantly predict delusional conviction ( $\beta = .27$ ;  $p < .001$ ), accept without judgement ( $\beta = -.16$ ;  $p < .01$ ), observe ( $\beta = .21$ ;  $p < .01$ ), and aware ( $\beta = .10$ ;  $p < .05$ ) all significantly predicted conviction. As with the two previous models, the describe subscale was not a significant predictor and the accept without judgement subscale was the only mindfulness scale to be associated with delusional ideation in the expected direction.

### **Summary**

In summary, negative schemas were found to significantly predict each of the delusional ideation subscales. In each of the cross-sectional models, only the mindfulness subscale of 'accept without judgement' was a significant predictor of any of the delusional ideation scales in the expected direction. Because the other mindfulness subscales did not consistently predict in the expected direction, a decision was made to exclude them from subsequent analyses and use only the 'accept without judgement' subscale.

### **Longitudinal findings**

Descriptive statistics and correlations for the Time 1 and Time 2 variables are presented in Table 2. In order to investigate how these variables were related to each other over time, a longitudinal cross-lag model was constructed (see Figure 1). In this way, one can determine the stability of variables over time as well as the residualized effects of Time 1 variables on other Time 2 variables. On the recommendation of Bijleveld and van der Kamp (1998), error terms between variables over time were correlated. Separate models were created for the three delusional ideation dimensions.

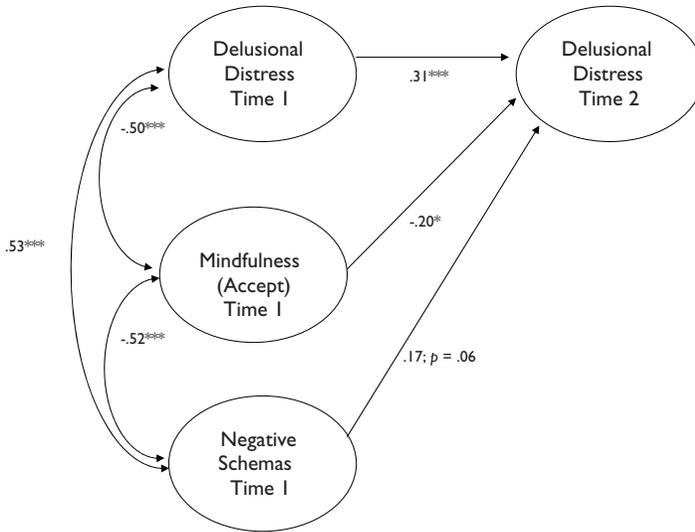
#### *Delusional ideation distress*

Two models were created to comparatively test the direct and indirect effects of mindfulness (accept without judgement) and negative schemas at Time 1 on change in delusional ideation distress at Time 2. In Model 1 (see Figure 1), direct, independent effects of mindfulness, and negative schemas were examined. Mindfulness was found to significantly predict change in delusional ideation distress ( $\beta = -.20$ ;  $p < .05$ ) and

**Table 2.** Inter-correlation of the variables at Time 1 and Time 2 (N = 204)

Variable	M	SD	KIMS ACCEPT T1	BSS T1	PDI DISTRESS T1	PDI PREOCC T1	PDI CONVIC T1	KIMS ACCEPT T2	BSS T2	PDI DISTRESS T2	PDI PREOCC T2	PDI CONVIC T2
KIMS ACCEPT T1	29.74	8.71										
BSS T1	53.96	12.97	-.50*									
PDI DISTRESS T1	14.01	10.56	-.50*	.44*								
PDI PREOCC T1	14.03	10.68	-.45*	.38*	.95*							
PDI CONVIC T1	18.32	13.44	-.38*	.29*	.86*	.89*						
KIMS ACCEPT T2	28.83	11.17	.49*	-.26*	-.23*	-.22*						
BSS T2	54.24	14.75	-.29*	.56*	.28*	.16	-.47*			.42*		
PDI DISTRESS T2	12.92	9.14	-.32*	.30*	.45*	.32*	-.40*			.39*	.93*	
PDI PREOCC T2	12.56	9.24	-.27*	.24*	.42*	.41*	-.40*			.29*	.85*	.88*
PDI CONVIC T2	16.11	10.50	-.18	.17	.37*	.37	-.32*					

Note. KIMS ACCEPT = Kentucky Inventory of Mindfulness Skills — acceptance without judgement; BSS, Brief Schema Scale; PDI, Peters Delusional Inventory.  
\*p < .01.



**Figure 1.** Direct effects model predicting changes in delusional ideation distress. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

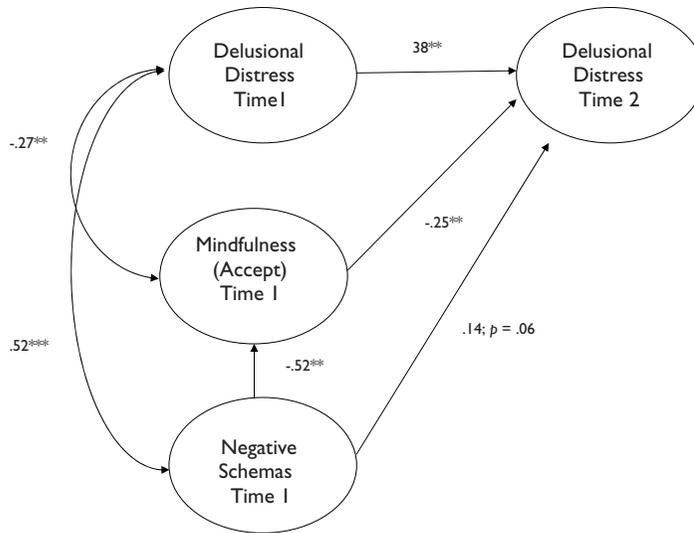
**Table 3.** Fit indices for the direct and indirect models, predicting delusional ideation distress ( $N = 204$ )

Model	Fit indices						
	$\chi^2$	<i>df</i>	$\chi^2/df$	GFI	CFI	sRMR	RMSEA
Direct	174.90	80	2.186	.89	.96	.06	.08
Indirect model	178.1	81	2.198	.90	.96	.03	.06

GFI, Goodness-of-Fit index; sRMR, Root Mean Square Residual; RMSEA, Root Mean Square Error of Approximation; CFI, Comparative Fit Index; AIC, Akaike information criterion.

negative schemas ( $\beta = .17; p = .06$ ) approached significance in predicting distress. The fit indices (see Table 3) indicated a reasonably close fit of the model to the data. A total of 32% of the variance in delusional ideation distress Time 2 was explained.

Model 2 (see Figure 2) tested the indirect effects (mediation) of negative schemas, that is, a pathway from negative schemas to mindfulness was specified rather than left as a non-directional correlation (i.e., a covariance). The variable of negative schemas was found to significantly predict mindfulness ( $\beta = -.52; p < .001$ ) and mindfulness was found to predict change in delusional ideational distress ( $\beta = -.25; p < .001$ ). A subsequent chi-squared difference test was conducted. This allows for the comparison of nested models to determine if a given model provides a significantly better or worse fit of the data. If the test is significant, the model with the more freely estimated parameters (in this case the direct effects model) provides a better fit of the data (Schermelleh-Engel, Moosbrugger, & Muller, 2003). If the test is non-significant, this indicates that the more constrained and parsimonious model (the indirect effects model) should be accepted. The test was non-significant ( $\chi(1) = 3.2, p > .01$ ), which indicates both that Model 2 does not represent a significant decrement in model fit and is more parsimonious.



**Figure 2.** Indirect effect model predicting changes in delusional ideation distress. \*\* $p < .01$ ; \*\*\* $p < .001$ ; n.s., non-significant.

Finally, the size and significance level of the indirect effects of negative schemas on change in delusional ideation were tested for. To do this, bootstrapping was used. Preacher and Hayes (2004) advocate the use of bootstrapping to address some of the problems associated with Baron and Kenny's (1986) causal steps procedure. Bootstrapping is a non-parametric test that generates representation of the sampling distribution of the indirect effect. Using resampling with replacement, a new sample is created from the original sample and the indirect effect can then be estimated. This process is then repeated multiple times (typically at least 1,000 times). This allows for the calculation of confidence intervals (either 95% or 99%) to determine if the indirect effect is significantly different from zero. The bootstrap analysis indicated that negative schemas had a small but significant indirect effect ( $\beta = .06$ ) on delusional ideation (95% CI of .002, .09). In this model, 30% of the variance of Time 2 delusional ideation distress was explained. As can be seen in Table 3, this model represented a slight improvement in fit to the data, providing support for the indirect effects hypothesis.

#### *Delusional ideation preoccupation*

As with the distress model, the direct effects of negative schemas and mindfulness on change in delusional preoccupation over time were examined. Delusional ideation preoccupation at Time 1 was found to significantly predict preoccupation at Time 2 ( $\beta = .35$ ;  $p < .001$ ). However, neither negative schemas nor mindfulness at Time 1 were found to significantly predict Time 2 preoccupation.

#### *Delusional ideation conviction*

The final model sought to predict delusional ideation conviction at Time 2. Time 1 conviction was found to predict Time 2 conviction ( $\beta = .43$ ;  $p < .001$ ). Similar, to preoccupation, Time 1 negative schemas and mindfulness were not found to predict Time 2 conviction.

In conclusion, some support for the mediation hypothesis over the direct effects hypothesis was found. However, this was only evident in predicting delusional ideation distress.

## Discussion

The current study investigated the impact of negative schemas and mindfulness on changes in delusional ideation. Specifically, two different models were tested: the direct effects model and the mediation model. Results from the cross-sectional analyses suggested that, of the four mindfulness subscales, only 'accept without judgement' showed the strongest and most consistent predicted relationships. Subsequent analyses with the 'accept without judgement' subscale indicated that it had significant, direct effects on all of the delusional ideation subscales. The variable of negative schemas was also found to be significantly associated with all of the delusional ideation subscales.

The longitudinal analyses examined the impact of negative schemas and mindfulness on change in delusional ideation dimensions, comparing the direct effects model with the indirect effects model. In the direct effects model, mindfulness was found to significantly predict change in delusional ideation distress over time. There was a trend for negative schemas also predicting change in distress over time. However, negative schemas were found to have a significant indirect effect via mindfulness in predicting change in delusional ideation distress across time. This effect was not evident for the other delusional ideation dimensions. Taken together, these findings provide some support for the indirect effects model, whereby the effect of negative schemas on distress is mediated by mindfulness.

These results indicate that a mindful stance of accepting internal experiences without engaging with or judging them is important for subsequent changes in delusional ideation distress. The results also suggest that the mechanism by which this occurs is not associated with a reduction in the amount the individual thinks about these ideas or how strongly they hold them. Perhaps, by cultivating a more general stance whereby such thoughts are accepted without judgement may allow the individual to step back and not become so entangled and therefore be less distressed. From the opposite perspective, if an individual was inclined not to accept their thoughts and judge them negatively, it might be expected that they would therefore be more distressed by these thoughts.

Negative schemas were shown to be cross-sectionally related to preoccupation, distress, and conviction with delusional ideas. In other words, the more negative a person's beliefs about themselves and others, the more likely they were to be distressed, preoccupied, and convinced by delusional-type thinking. These findings are broadly consistent with previous research (Barrowclough *et al.*, 2003; Smith *et al.*, 2006). Interestingly, no direct relationship between negative schemas and change in delusional ideation was found over time. This result indicates that at least one pathway by which negative schemas influence changes in delusional ideation is through mindfulness. The results of this study suggest that a person's negative schemas have an impact on mindfulness ability. It can therefore be speculated that a person's mindfulness ability may be affected by previous life experiences, via negative schemas. The presence of negative core schemas producing very strong schema-related affect and cognition could hamper an individual's ability to mindfully engage with such psychological content.

The current research suggests that negative schemas and capacity for mindfulness have important implications for changes in delusional ideation distress and that these variables may be important for the subsequent development of delusional ideation. These findings point towards the need for prophylactic interventions that address negative

schemas and teach mindfulness skills in order to assist in reducing distress associated with delusional ideation. We believe that these results also provide support for models such as that proposed by Chadwick (2006), which target these variables in people with distressing psychosis.

### **Limitations**

Although the present research sought to address a number of the methodological problems evident in the previous literature, there remained several limitations. One possible issue is the reliance on web-based self-report measures. This methodology may have obtained biased data in some fashion. On the other hand, research suggests no significant differences in the psychometric properties of psychological measures completed online when they are compared to paper-based versions completed in person (Lewis, Watson, & White, 2009; Riva, Teruzzi, & Anolli, 2003). Another issue is possible mono-source bias; the use of ratings from an alternative source such as a family member would further augment the present findings by providing a more comprehensive view of the individual.

In spite of previous reports of reliability and validity, in this study, there were problems with the measurement of mindfulness. Although the internal consistency estimates for each of the subscales was high, the inter-correlations between the subscales suggested there was not a central underlying dimension, but rather multiple constructs. This was supported by the inter-correlations with the other variables in the study. For example, the 'observe' subscale was positively correlated with all of the delusional ideation dimensions. It is possible that this subscale may have tapped into underlying hypervigilance as is suggested by items such as 'I notice changes in my body, such as whether my breathing slows down or speeds up' and 'I pay attention to whether my muscles are tense or relaxed'. These results do point towards the difficulties in measuring abstract constructs such as mindfulness and suggest that measures that use more concrete behavioural indicators may be more successful.

While this study provided evidence for a mediation role of mindfulness, it is possible that unmeasured variables could account for this relationship. For example, personality variables, such as negative affectivity, may operate to influence both mindfulness and delusional ideation, creating a spurious effect.

The current study did not include any measures of tangible outcome or functioning. The extent to which the observed changes in delusional ideation are related to meaningful outcomes or daily functioning is therefore unclear. The inclusion of a quality of life scale would help to address this.

A final issue relating to the sample is concerned with the representativeness of the sample used. The current study utilized a student sample, with an overrepresentation of females, recruited via e-mail and therefore this sample is unlikely to be representative of the general population. Further research with a broader sample base would indicate whether the current results are generalizable.

Finally, it is possible that the number of cross-lagged associations in the longitudinal analyses may have been affected by the length of the lag. The 6-month time interval between measurement points may have been too short (or too long) to observe changes. The ideal time lag for longitudinal research is not easily determined and some authors recommend the use of multiple measurement points in order to avoid this issue (Coyné & Racioppo, 2000). However, increasing the length of time and increasing the number of times of measurement will increase participant attrition and greater costs.

### Future research

Although there is emerging evidence suggesting that mindfulness and acceptance interventions may be useful for people with psychosis (Bach & Hayes, 2002; Gaudiano & Herbert, 2006), these studies are not able to specify which components of the treatment was responsible for therapeutic change. Future research could usefully build on the results of the current study to investigate, with greater specificity, the impact of interventions that target mindfulness skills, particularly those that emphasize increased acceptance of internal experiences.

### Conclusions

In conclusion, understanding factors that contribute to the development and maintenance of delusional ideation in non-clinical groups has important implications for intervention. The results from the current study suggest that both negative schemas and mindfulness play a role in changes in delusional ideation distress over time and warrant further investigation.

### Acknowledgement

We are grateful for the advice and feedback provided by Andrew J. Hart in the preparation of this paper.

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