

Predicting the Occurrence, Conviction, Distress, and Disruption of Different Delusional Experiences in the Daily Life of People with Schizophrenia

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Recent research has shown that negative emotional states of increased anxiety and sadness prospectively predict the occurrence of persecutory ideation, but it is not known whether these findings extend to other subtypes of delusions. The current study explored whether these negative emotional states, as well as hallucinations, biased reasoning style (ie, jumping to conclusions), and negative self-esteem prospectively predict the occurrence and various dimensions of delusions of control, reference, and grandiosity in real time, as they occur in daily life. One hundred and thirty community-dwelling participants with schizophrenia or schizoaffective disorder completed laboratory measures and momentary self-reports generated by a personal digital assistant multiple times per day, over 7 consecutive days. Analyses were time lagged allowing simultaneous examination of person-level and within-person time-varying relationships among the variables. Approximately, half of the participants reported having at least one delusional experience during the week, and approximately, a quarter of those individuals reported experiencing all 3 delusion subtypes. Hallucinations were a significant predictor of the occurrence of delusions of control and reference over the subsequent hours of the same day, but negative emotional states of anxiety and sadness were not. Negative self-esteem predicted the frequency of all 3 delusion subtypes during the week, and a reasoning style characterized by reduced information gathering was a significant predictor of the frequency of delusions of control. Delusional dimensions of conviction, distress, and disruption had different associations with the variables tested for each delusion subtype.

Key words: delusions/hallucinations/emotions/reasoning/self-esteem/experience sampling method (ESM)/schizophrenia

Introduction

Delusions are considered to be among the core symptoms of severe psychiatric illnesses, such as schizophrenia and schizoaffective disorder. Traditionally, delusions were conceptualized as persistent, incorrigible, irrational beliefs, held with absolute conviction. For example, Jaspers¹ characterized delusions as being “held with an extraordinary conviction, with an incomparable, subjective certainty,” in addition to having “an imperviousness to other experiences and to compelling counter-argument” (pp 95–96). Similarly, the American Psychiatric Association’s *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*² characterizes delusions as false beliefs that are “firmly sustained ... despite what constitutes incontrovertible and obvious proof or evidence of the contrary” (p. 765). However, empirical studies over the last decades suggest that even within the context of chronic schizophrenia, the experiences that are typically classified as delusions appear to be much more dynamic and potentially malleable than previously believed.

Findings from longitudinal research suggest that delusional beliefs are more likely to wax and wane over time, instead of being omni-present.^{3–6} In addition, it has been increasingly recognized that the occurrence of a belief characterized by irrational content is only one component of what are broader multidimensional delusional experiences.^{7–9} Factor analytic studies have identified a number of important delusional dimensions, including conviction (ie, the strength with which the belief is held), subjective distress, and associated disruption in functioning.^{10–12} Dimensions of delusional experiences are relatively independent of each other and may vary in intensity within individuals across months, weeks, and even days.^{13–15} Research furthering our understanding of the factors that influence delusional dimensions can play a crucial role informing emerging treatments

designed to target delusions and in improving existing cognitive-behavioral and other psychosocial interventions so that they can better focus on the aspects of delusional experiences that are the most troubling to individuals seeking care.^{9,16–18}

A research paradigm that is ideally suited to capture the natural ebb-and-flow of delusions is the Experience Sampling Method (ESM).^{19,20} ESM (alternatively referred to as Ecological Momentary Assessment) is an intensive repeated measures strategy that utilizes an electronic device to prompt participants to complete self-report questionnaires in real time, multiple times a day, within the context of their own environment.²¹ Computerized ESM uses handheld computers such as personal digital assistants (PDAs), which provide signaling, responding, and data storage through a single device. Studies have recently shown that computerized ESM is a feasible and valid approach to data collection in both hospitalized²² and community-dwelling^{23,24} people with schizophrenia. A major advantage of computerized ESM is that all self-reports are time stamped, enabling researchers to accurately map the sequence of events over a given period of data collection and examine prospective relationships between variables over time within individuals.²⁵

Recently, we completed the largest computerized ESM study to date with people with psychosis and examined prospective predictors of persecutory ideation in 145 community-dwelling people with schizophrenia or schizoaffective disorder.²⁵ Participants completed self-report assessments generated by a PDA multiple times a day for 1 week. Time-lagged analyses of their responses revealed that negative emotional states of increased anxiety and sadness were significant in vivo predictors of the occurrence of persecutory thoughts in the subsequent hours of the same day. The findings were consistent with cognitive models of the positive symptoms of psychosis^{17,26,27} that propose a role for the cognitive content of negative emotional states in the formation and maintenance/recurrence of positive symptoms, adding to a growing literature that suggests specific psychotic symptoms may be well addressed with treatments targeting emotional dysfunction.^{9,16,18,28}

Persecutory delusions have, by far, received the most attention by clinical researchers, but the phenomenology, clinical dimensions, and risk factors for other common delusion subtypes (eg, control, reference, and grandiosity) have gone largely underexplored. In addition, paranoia involves a strong element of fear and subjective distress.^{17,27} Therefore, our finding of a prospective relationship between states of increased anxiety and sadness and subsequent experiences of persecutory ideation was informative but not entirely surprising. Whether these findings extend to other subtypes of delusions that do not have such a clear and intuitive relationship to negative emotional processes, or may even be subjectively experienced as empowering (eg, grandiosity), requires further investigation.

Even within populations that are at increased risk for developing delusions, not everyone experiences the same delusional themes or reports equal associated levels of distress or disruption to functioning. Because psychosocial treatments for schizophrenia grow increasingly more refined,¹⁸ it would be advantageous to conduct research that helps identify variables that can serve as the most relevant targets for delusion-specific treatments. Building upon our previous findings showing prospective relationships between negative emotional states and paranoia, the purpose of the present study was to examine whether the same negative emotional states prospectively predict other delusion subtypes as they occur in the daily life of people with schizophrenia or schizoaffective disorder. Specifically, we explore whether increased state anxiety and sadness, as well as a number of other factors proposed by a comprehensive cognitive model of the positive symptoms of psychosis²⁶ (ie, hallucinations, reasoning style, and negative self-esteem) are prospectively associated with the occurrence, conviction, distress, and disruption to activities of delusions of control, reference, and grandiosity. To do so, we collected laboratory measures and computerized ESM self-reports over 7 consecutive days from 130 community-dwelling participants with schizophrenia or schizoaffective disorder.

Methods

Participants

This study was approved by the Institutional Review Board for the University of California, San Diego. Participants were recruited from a larger psychosocial treatment outcome study requiring patients with schizophrenia or schizoaffective disorder to be physically and clinically stable enough to participate in outpatient group therapy and to not have received cognitive-behavioral therapy in the past 5 years. One hundred and ninety-nine community-dwelling people with schizophrenia ($n = 144$) or schizoaffective disorder ($n = 55$) were invited to participate. Individuals who refused participation ($n = 16$) did not differ from those who enrolled in the study concerning age, $t_{197} = 0.854$, $P > .05$, sex, $X^2(1) = 0.262$, $P > .05$, or Positive and Negative Syndrome Scale (PANSS) positive symptoms, $t_{197} = 1.002$, $P > .05$, but they had higher scores for PANSS negative symptoms $t_{196} = 2.299$, $P < .05$ as well as total PANSS severity, $t_{196} = 2.354$, $P < .05$. Thirteen individuals who agreed to participate did not complete the study due to technical problems, 25 participants were excluded for not achieving minimum compliance (defined as providing the equivalent of at least 2 full days of ambulatory monitoring), and an additional 15 participants were dropped from the multilevel analyses due to missing laboratory assessment data. The final participating sample included 130 individuals with a mean age of 46.2 (SD = 11.24) and 12.42 years

of education ($SD = 2.15$). These participants were 59% male, 59% white, 15% African–American, 14% Hispanic, and 12% other ethnicities. The mean length of illness reported by participants was 25.37 years ($SD = 13.39$; range = 2–59 years). At baseline, the final sample experienced moderate psychotic symptom severity (PANSS total $M = 66.69$, $SD = 17.51$; Positive symptom score, $M = 18.15$, $SD = 5.99$; Negative symptom score, $M = 15.33$, $SD = 5.74$), mild depression symptom severity (Beck Depression Inventory II [BDI-2] $M = 15.56$, $SD = 10.86$), mild anxiety symptom severity (Beck Anxiety Inventory [BAI] $M = 14.33$, $SD = 11.61$), and 50% of participants resided in assisted living facilities (“board and care”).

Procedures

After providing written informed consent, patients were administered a structured diagnostic interview (Structured Clinical Interview for DSM-IV Axis I Disorders–Patient Edition²⁹) in order to verify diagnoses of schizophrenia and to assess additional lifetime and current mental disorders. Patients then completed an extensive battery of laboratory-based self-report and interview measures that included demographic information, measures of symptoms of schizophrenia (PANSS³⁰), symptoms of anxiety (BAI³¹), symptoms of depression (BDI-2³²), probabilistic reasoning (Beads Task³³), and self-esteem (Self-Esteem Rating Scale–Short Form [SERS-SF]³⁴). Following assessment, a 45-min training session was provided concerning the meaning of all computerized ESM questions and response choices, as well as training in how to operate a PDA programmed using a modified version of the Purdue Momentary Assessment Tool version 2.1.2.³⁵ ESM sampling schedules, electronic interview content and question format were previously validated in a subsample ($n = 56$) of current participants (Granholt et al²³). In summary, participants were given PDAs to carry with them for 7 days, and each PDA was programmed to administer 4 electronic interviews per day. The PDA program permitted responses to be provided only within a 15-min period following the signal, and all data entries were time stamped. The assessment times were fixed for each participant but randomized across participants. Investigation of fatigue effects and reactivity to the ambulatory methodology using this specific protocol revealed no correlation of time in the study with missing data or with the frequency or intensity of variables,²⁴ and no participant indicated that they changed their usual activities due to PDA use. The signals occurred within each of the following time periods: 9:00 AM to 12:00 noon; 12:00 noon to 3:00 PM; 3:00 PM to 6:00 PM; and 6:00 PM to 9:00 PM. Sampling windows were also adjusted to accommodate each participant’s typical sleep and wake schedules. Participants were given the capacity to temporarily silence alarms as a function of social or personal constraints (eg, during church, driving, naps). Two practice ESM questionnaires

were completed in the laboratory under the supervision of the research staff in order to resolve eventual difficulties or address questions. Individuals demonstrating greater difficulty in understanding questions or operating the device were provided additional training. Information about sampling procedures, battery charging, and a pager number to call in case of questions were provided to participants in writing along with a carrying pack. All participants were then contacted once by telephone on the third day of sampling to resolve any question or difficulties and to remind participants to charge the PDA. Participants received \$35 for completing the weeklong ESM assessments.

Measures

Reasoning/Information Gathering Style: Beads Task. The bead task was designed to assess probabilistic reasoning/data gathering style.³³ We used the draws to decision (DTD) variant of the paradigm, which has repeatedly been shown to differentiate between deluded and nondeluded participants.³⁶ The task included 2 conditions. In each condition, participants were shown 2 jars each containing 100 beads of 2 different colors. In the first condition, the 2 jars contained green and red beads in equal and opposite ratio of 85:15 and 15:85, respectively; in the second condition, the jars contained green and red beads in a ratio of 60:40 and 40:60, respectively. In each condition, participants were shown beads one at a time and asked to decide which jar they came from. Participants were free to make the determination when they wished: they could either make a decision after seeing the bead or request to gather additional information (ie, have another bead drawn) with the trial terminating only after they affirm they are certain about their choice. The variable used here was a composite score combining the number of beads requested in both conditions before making a decision.

Negative Self-esteem: SERS-SF. The 20-item SERS-SF is a more parsimonious version of the original 40 item SERS³⁶ measure of self-esteem.³⁴ The SERS-SF has been shown to have superior construct validity relative to the longer SERS in individuals with schizophrenia and schizoaffective disorder.³⁴ The SERS-SF has two 10-item subscales consisting of positive and negative evaluations of social competence, problem solving ability, intellectual ability, and self-worth compared with others. Each item is scored on a 7-point scale, ranging from 1 (never) to 7 (always). Negative evaluative beliefs about the self have been found to be independently associated with symptoms of psychosis^{28,37}; therefore, we used the negative subscale score as the variable for our analyses.

Computerized ESM Measures. Fifteen items from a larger questionnaire²³ were selected to examine participants’ levels of anxiety, sadness, hallucinations, occurrence of delusions of reference, grandiosity, and control, as well as dimensions of individual belief conviction, distress,

Table 1. Description of the Computerized ESM Question Items

Negative emotional states	
Anxious (L)	“How anxious do you feel right now?”
Sad (L)	“How sad do you feel right now?”
Hallucinations (D)	“Since the last questionnaire, have you heard things (such as voices), had visions, or seen things that others could not see or hear?”
Occurrence of delusions	
Control (D)	“you were possessed or that someone or something was putting thoughts into your mind?”
Reference (D)	“that someone could communicate with you through the television or radio?”
Grandiosity (D)	“you had special powers to do something nobody else can do?”
Delusional dimensions	
Conviction (L)	“How strongly do you believe (X)?”
Distress (L)	“How much did your thoughts about (X) cause you distress?”
Disruption (L)	“How much did your thoughts about (X) interfere with what you were doing?”

Note: ESM, experience sampling method. (L) participant rated on a 7-point visual analog scale (1-“not at all” to 7-“extremely”), (D) dichotomous variable (1-“no,” 2-“yes”), (X) content for each question matched the content of the preceding “irrational belief” question.

and disruption (table 1). Items focusing on psychotic symptoms were modeled after the Psychotic Symptom Rating Scales³⁸ and have previously been shown to have convergent validity with the PANSS positive symptom subscale.²³ The dimensional items were administered by the PDA as follow-up questions only if the participant endorsed having delusions of control, reference, or grandiosity. Data were time lagged so that the occurrence of irrational thoughts, as well as belief conviction, distress, and disruption could be regressed on participant ratings of sadness, anxiety, and hallucinations measured at the previous assessment point, and reasoning style and negative self-esteem measured in the laboratory.

Overview of Analyses

Multilevel analyses were conducted to simultaneously model person-level and within-person time-varying relationships, using the program HLM 6.08.³⁹ Separate analyses were conducted predicting the occurrence of each delusion subtype. Because these outcomes were binary, a multilevel logistic regression model was used for these analyses. Model coefficients were estimated using a unit-specific model with penalized quasi-likelihood estimation.⁴⁰

Supplemental analyses were conducted predicting delusional conviction, distress, and disruption, using a hierarchical linear model. Because the dimensional ratings were collected only when the participant indicated the occurrence of a delusional belief, the sample sizes for the supplemental analyses were considerably smaller.

The same model specification was used in each of the analyses. A lagged regression approach was used to predict the delusional belief at time t from time-varying predictors (sadness, anxiety, and hallucinations) measured at time $t - 1$, while controlling for the delusional belief at time $t - 1$. The time lag was defined as the immediately preceding measurement period, regardless of whether data were available. Thus, cases with missing data on the relevant variables at either time t or time $t - 1$ were excluded from each analysis. Furthermore, time-lagged predictors were included only within the same day (ie, overnight time lags were excluded). Use of the lagged predictors permits examination of whether the predictors account for subsequent changes in delusional beliefs, which permits stronger inferences than simply modeling correlations in cross-sectional data. The within-person relationships were estimated with fixed slopes (ie, only the intercept had a random effect in the between-person model).

In addition to the time-varying predictors, 2 person-level variables (negative self-esteem and reasoning style) were included as predictors of the intercept of the within-person model. Because all predictors were centered around the grand mean, the coefficients for these variables represent the relationship between each predictor and the persons average response on the outcome variable. In the case of belief occurrence, these results reflect the prediction of the proportion of time measurements on which a delusional belief occurred.

For significant predictors, follow-up descriptive analyses were conducted to probe the pattern of results. For these analyses, the regression model was used to compute predicted values of the outcome variable at high and low values of each significant predictor, while controlling for all other predictors by setting them at their means. For continuous predictors, high and low values were set at 1 SD above and below the mean, except for reasoning style. Due to the positively skewed distribution of reasoning style, the lowest value in the data was 0.75 SD below the mean. Therefore, this minimum value was used to represent a low value of reasoning style. For the logistic regression analyses, predicted values were translated into predicted probabilities for ease of interpretation.

Results

All ESM and laboratory variables are described in table 2. Overall, 52 % of the sample reported experiencing at least one delusion during the week of data collection, with 36.9% experiencing delusions of control, 30.8%

Table 2. Descriptive Statistics

Variable	N	Symptom	M	SD
ESM measures				
Sadness	1428		2.37	1.56
Anxiety	1428		2.63	1.69
Hallucinations occurrence	1428	32%		
Delusions of control				
Occurrence	1428	16%		
Conviction	224		5.57	1.5
Distress	224		4.25	1.8
Disruption	224		3.93	1.72
Delusions of reference				
Occurrence	1428	13%		
Conviction	182		5.24	1.67
Distress	182		4.34	1.8
Disruption	181		4.01	1.75
Delusions of grandiosity				
Occurrence	1428	11%		
Conviction	160		5.31	1.61
Distress	161		3.19	1.95
Disruption	161		3.15	1.95
Baseline measures				
Negative self-esteem	130		32.72	13.72
Reasoning style (DTT)	130		8.98	11.92

Note: *N* represents the number of observations used for analyses, which includes multiple responses over time from each participant. “Symptom” indicates the percentage of observations on which symptoms were endorsed. Delusional dimensions of conviction, distress, and disruption were only measured in participants that endorsed delusion occurrence.

experiencing delusions of reference, and 27.7% experiencing delusions of grandiosity. A minority of the participants reported experiencing multiple subtypes of delusions (16.2% experienced 2 types, 13.8% experienced all 3 types). The frequency with which delusions occurred for a single person ranged from 0% to 100% of the measures taken. On average, delusions of some kind were experienced on 24% (*SD* = 43) of the measurements, with average rates of 18% (*SD* = 33) for delusions of control, 16% (*SD* = 30) for delusions of reference, and 14% (*SD* = 30) for delusions of grandiosity (The percentages reported in the text represent the average rate of occurrence of delusions within individuals and are slightly different from the percentages reported in table 2 which represent the total percentage of observations on which delusions occurred. The numbers differ because each individual contributed a different number of observations to the total.).

Delusion Occurrence

An initial multilevel analysis was conducted on the predictors of any type of delusion. For this analysis, a delusion was coded as occurring at a particular time period if the person indicated experiencing a delusion of control, reference, or grandiosity. Table 3 summarizes the results

Table 3. Multilevel Logistic Regression of Delusion Occurrence (Any Type)

Predictor	Coefficient	SE	OR	OR CI
Intercept	-1.85			
Person-level predictors				
Negative self-esteem	.05**	0.01	1.05	1.03, 1.08
Reasoning style	-.03	0.02	0.97	0.93, 1.01
Within-person predictors				
Previous delusion ^a	1.60**	0.35	4.95	2.51, 9.75
Sadness	-.05	0.09	0.95	0.80, 1.12
Anxiety	.09	0.06	1.09	0.97, 1.23
Hallucinations	1.23**	0.27	3.43	2.02, 5.84

Note: Person-level *df* = 127, within-person *df* = 1421.

^aOutcome variable measured at previous time period.

P* < .05; *P* < .01.

of this analysis. Of the within-person predictors, only hallucinations were significantly related to delusion occurrence, with a regression coefficient (γ) of 1.23, *P* < .01. This corresponds to an OR of 3.43, indicating a strong relationship. After controlling for all other predictors by setting them at their means, the predicted probability of a delusion was .27 for persons who had experienced a hallucination on the previous data collection point, whereas the predicted probability was only .10 when no prior hallucination had been reported.

Among the person-level variables, negative self-esteem was significantly related to the experience of a delusion, $\gamma = 0.05$, *P* < .01, while reasoning style was not a significant predictor. It is important to note that the OR reported for negative self-esteem in table 3 reflect the relative odds associated with the 1-point change in the predictor and therefore underestimate the magnitude of the relationship, which was quite strong. A 1 SD change in negative self-esteem was associated with an OR of 2.05. For persons with more negative self-esteem (1 SD above the mean), the predicted probability of a delusion was .24, while for persons with less negative self-esteem, the predicted probability of delusion was .07.

Delusions of Control

Table 4 summarizes the multilevel analysis of the occurrence of delusions of control, as well as analyses of the conviction, distress, and disruption to activity ratings for instances when these delusions occurred. Of the momentary/state predictors, only hallucinations were a significant predictor of the occurrence of delusions of control, $\gamma = 1.53$, *P* < .01. Experiencing hallucinations at the prior data collection point had a strong effect, as indicated by the OR of 4.63. When not preceded by hallucinations, the predicted probability of delusions of control was only .03, but this probability increased to .14 when preceded by hallucinations. Although hallucinations were positively related to the occurrence of

Table 4. Multilevel Analysis of Delusions of Control

Predictor	Occurrence		Conviction		Distress		Disruption		
	Coefficient ^a (SE)	OR (CI)	Coefficient ^b (SE)	Beta	Coefficient ^b (SE)	Beta	Coefficient ^b (SE)	Beta	
Intercept	-2.85		5.22		3.77		3.68	.38	
Person-level predictors									
Negative self-esteem	.06** (0.02)	1.06	(1.03, 1.09)	-.01 (0.01)	-.13	.00 (0.01)	.04	.00 (0.01)	.03
Reasoning style	-.07** (0.02)	0.93	(0.89, 0.98)	-.12* (0.05)	-.47	-.06 (0.03)	-.18	-.08 (0.05)	-.28
Within-person predictors									
Previous delusion ^c	1.21** (0.34)	3.34	(1.72, 6.50)	.14 (0.09)	.15	.11 (0.13)	.11	.19** (0.06)	.19
Sadness	.05 (0.08)	1.05	(0.89, 1.24)	.09 (0.05)	.09	.30** (0.07)	.26	.14** (0.05)	.12
Anxiety	.07 (0.07)	1.08	(0.94, 1.23)	.11** (0.03)	.13	.03 (0.07)	.11	.15* (0.06)	.15
Hallucinations	1.53** (0.30)	4.63	(2.55, 8.41)	-.44* (0.19)	.47	.35 (0.65)	.09	-.64* (0.29)	-.17

Note: CI = 95% confidence interval on the OR.

^aResults for occurrence are logistic regression coefficients. Person-level $df = 127$, within-person $df = 1421$.

^bPerson-level $df = 28$, within-person $df = 160$.

^cOutcome variable measured at previous time period.

* $P < .05$; ** $P < .01$.

delusions of control, they were negatively related to associated levels of belief conviction, $\gamma = -0.44$, $P < .05$, and disruption to activities, $\gamma = -0.64$, $P < .05$, reported by those who were experienced a delusion.

Sadness and anxiety were not significantly related to the occurrence of delusions of control, but they were both related to delusional dimension ratings. Specifically, sadness was positively related to ratings of distress, $\gamma = 0.30$, $P < .01$, and disruption, $\gamma = 0.14$, $P < .01$. Anxiety was positively related to conviction, $\gamma = 0.11$, $P < .01$, and disruption, $\gamma = 0.15$, $P < .05$. All these relationships reflected small effect sizes, with standardized coefficients ranging from 0.12 to 0.26. Taken together, the time-varying predictors accounted for 7% of the within-person variance in conviction and disruption (after controlling for prior delusional beliefs) but only 1% of the variance in distress.

At the person level, both negative self-esteem and reasoning style were significantly related to the frequency of delusions of control. Negative self-esteem was positively related to the frequency of delusions of control, $\gamma = 0.06$, $P < .01$. On average, participants with more negative self-esteem (1 SD above the mean) experienced delusions on about 11% of the time periods measured, whereas those with less negative self-esteem (1 SD below the mean) experienced these delusions on only 3% of the measurements. Negative self-esteem was not significantly related to any of the delusion dimension ratings.

Reasoning style was negatively related to the frequency of delusions of control, $\gamma = -0.07$, $P < .01$. On average, participants with DTD scores 1 SD above the mean on the "beads task" experienced delusions of control on 2% of the momentary measurements, in comparison to the those with the lowest DTD scores (due to the positively skewed distribution of the beads task, low DTD

was defined as the lowest observed score, which was 0.75 SD below the mean), who experienced these delusions on 12% of the measurements. DTD scores were also negatively related to ratings of belief conviction, $\gamma = -0.12$, $P < .05$. Taken together, the person-level predictors accounted for 25% of the between-person variance in belief conviction.

Delusions of Reference

Table 5 summarizes the multilevel analyses for delusions of reference. Hallucinations were the only momentary/state predictor that was significantly related to the occurrence of delusions of reference, $\gamma = 0.78$, $P < .05$. This was a strong effect, as indicated by the OR of 2.18. Individuals who had experienced a hallucination during the previous measurement were more likely to experience a delusion of reference (probability = .07) than those who had not previously experienced a hallucination (probability = .03). Hallucinations were negatively related to ratings of delusion conviction, $\gamma = -0.82$, $P < .01$.

Although anxiety did not significantly predict the occurrence of delusions of reference, it was positively related to levels of associated belief conviction, $\gamma = 0.15$, $P < .01$, and disruption, $\gamma = 0.15$, $P < .01$. As indicated by the standardized coefficients of .14 to .15, these were fairly weak relationships. Taken together, the within-person predictors accounted for 5% of the variance in belief conviction (controlling for prior delusional belief) but less than 1% of the variance in disruption.

At the person level, delusions of reference were significantly predicted by negative self-esteem, $\gamma = 0.07$, $P < .01$. On average, participants with more negative self-esteem (scores 1 SD above the mean) experienced

Table 5. Multilevel Analysis of Delusions of Reference

Predictor	Occurrence			Conviction		Distress		Disruption	
	Coefficient ^a (SE)	OR (CI)		Coefficient ^b (SE)	Beta	Coefficient ^b (SE)	Beta	Coefficient ^c (SE)	Beta
Intercept	-3.08			5.18		4.05		3.74	
Person-level predictors									
Negative self-esteem	.07** (0.02)	1.07	(1.04, 1.11)	.01 (0.01)	.08	.01 (0.01)	.06	-.01 (0.02)	-.06
Reasoning style	-.02 (0.02)	0.98	(0.93, 1.02)	-.08** (0.02)	-.50	-.02 (0.02)	-.09	-.04* (0.02)	.31
Within-person predictors									
Previous delusion ^d	2.21** (0.44)	9.15	(3.83, 21.86)	.18 (0.09)	.19	.59** (0.12)	.57	.28* (0.13)	.28
Sadness	-.05 (0.11)	0.95	(0.77, 1.17)	.00 (0.07)	.00	.09 (0.10)	.08	-.06 (0.07)	.05
Anxiety	.03 (0.08)	1.03	(0.89, 1.20)	.15** (0.05)	.12	.01 (0.08)	.01	.15** (0.04)	.14
Hallucinations	.78* (0.33)	2.18	(1.15, 4.12)	-.82** (0.26)	-.23	.15 (0.30)	.04	.61 (0.59)	.16

Note: CI = 95% confidence interval on the OR.

^aResults for occurrence are logistic regression coefficients. Person-level *df* = 127, within-person *df* = 1421.

^bPerson-level *df* = 23, within-Person *df* = 129.

^cPerson-level *df* = 23, within-person *df* = 128.

^dOutcome variable measured at previous time period.

* *P* < .05; ***P* < .01.

these delusions on 11% of the time measurements, in comparison to those with less negative self-esteem (1 SD below the mean), who experienced delusions of reference on 2% of the measurements.

Reasoning style did not significantly predict the occurrence of delusions of reference. However, it was negatively related to the conviction, $\gamma = -0.08$, $P < .01$, and disruption, $\gamma = -0.04$, $P < .05$, associated with delusions. In sum, the person-level predictors accounted for 47% of the between-person variance in conviction and 24% of the variance in disruption.

Delusions of Grandiosity

Results for delusions of grandiosity are summarized in table 6. None of the time-varying predictors were significantly related to the occurrence of delusions of grandiosity or to the ratings of belief conviction, distress, and disruption. At the person level, negative self-esteem was positively related to the occurrence of delusions, $\gamma = 0.04$, $P < .05$. For those with more negative self-esteem (1 SD above the mean), the chance of experiencing a delusion of grandiosity during the week was 0.07, while for those with less negative self-esteem (1 SD below the mean),

Table 6. Multilevel Analysis of Delusions of Grandiosity

Predictor	Occurrence			Conviction		Distress		Disruption	
	Coefficient ^a (SE)	OR (CI)		Coefficient (SE) ^b	Beta	Coefficient (SE) ^c	Beta	Coefficient (SE) ^c	Beta
Intercept	-3.21			5.34		3.12		3.05	
Person-level predictors									
Negative self-esteem	.04* (0.02)	1.04	(1.01, 1.08)	-.05* (0.02)	-.40	.02 (0.04)	.11	.05 (0.04)	.32
Reasoning style	-.04 (0.03)	0.96	(0.92, 1.01)	-.03 (0.04)	-.21	-.02 (0.03)	-.10	-.03 (0.03)	-.15
Within-person predictors									
Previous delusion ^d	1.93** (0.47)	6.90	(2.76, 17.30)	.02 (0.10)	.02	.27** (0.13)	.22	.26 (0.15)	.21
Sadness	-.14 (0.09)	0.87	(0.73, 1.04)	.10 (0.11)	.10	.00 (0.07)	.00	-.04 (0.07)	-.03
Anxiety	.09 (0.08)	1.09	(0.93, 1.28)	.05 (0.05)	.05	.09 (0.07)	.08	.03 (0.05)	.03
Hallucinations	.72 (0.39)	2.06	(0.96, 4.43)	.81 (0.68)	.24	.52 (0.55)	.13	.37 (0.61)	.09

Note: CI = 95% confidence interval on the OR.

^aResults for occurrence are logistic regression coefficients. Person-level *df* = 127, within-person *df* = 1421.

^bPerson-level *df* = 17, within-person *df* = 117.

^cPerson-level *df* = 17, within-person *df* = 118.

^dOutcome variable measured at previous time period.

* *P* < .05; ***P* < .01.

the probability of a delusion of grandiosity was .02. Although persons with more negative self-esteem were more likely to experience a delusion, they actually reported lower conviction in these delusions when they occurred, as indicated by the negative relationship between negative self-esteem and conviction ratings, $\gamma = -0.05$, $P < .05$. The standardized coefficient of $-.40$ indicates a moderate relationship. However, ANOVA accounted for suggests a weaker relationship, with the person-level predictors accounting for only 2% of the between-person variance in conviction.

Discussion

Although delusions have been historically viewed as persistent, unwavering false beliefs, there is a growing body of clinical and research evidence that suggests delusional experiences are far more fluid than previously believed.^{14,15,41} To gain better insight into the daily experience of delusions, the current study utilized a paradigm that can effectively capture the ebb-and-flow of symptoms and emotions as they naturally occur in one's own environment.

Our previous computerized ESM investigation showed that negative emotional states of increased anxiety and sadness predicted the subsequent occurrence of persecutory ideation but experiencing hallucinations did not.²⁵ In the current study focusing on delusions of control, reference, and grandiosity, the reverse was true; negative emotional states did not prove to be significant prospective predictors of the occurrence of any form of delusional ideation, while experiencing hallucinations proved to be the most important predictor of subsequent delusions of control and reference. This would suggest that while the negative cognitive content activated in states of increased anxiety and sadness may feed into the formation/activation of persecutory beliefs,^{17,25,27} it may not play quite such a salient role in the formation of other delusion subtypes.

Experiencing hallucinations was the strongest independent predictor of having delusions of control and reference over the subsequent hours of the same day. This finding lends support to theories of psychosis, which suggest that delusions are, in part, the cognitive outcomes of individuals' attempts to explain various anomalous experiences.^{26,41,42}

A reasoning style characterized by reduced evidence gathering (ie, less DTD on the bead task) was associated with the real-time occurrence of delusions of control during the week. These findings add to previous empirical studies that showed associations between a tendency to make decisions about unknown situations using insufficient information (ie, jumping to conclusions) and clinic/laboratory-based retrospective reports of delusions.^{33,41,43}

Negative self-esteem measured at the beginning of the week was associated with the occurrence of all 3 delusion

subtypes in the subsequent days. Negative beliefs about self-worth have been shown to be associated with a number of psychiatric conditions.⁴⁴ The role of self-esteem as a possible causal factor in the formation of delusions has been the topic of much debate and the focus of 2 theoretical approaches. Building upon Neale's earlier formulation of the role of grandiosity in manic episodes,⁴⁵ Bentall and colleagues⁴⁶⁻⁴⁸ have proposed that paranoid delusions specifically are the unintended product of attempts to defend against loss of self-worth in individuals with underlying poor self-esteem. In contrast, Garety and colleagues²⁶ suggest that negative beliefs about the self contribute content directly to the formation and maintenance of delusions. Our findings may be explained by both of these models; in line with the notion of a defensive role for delusions, the associations we found between increased negative self-esteem and the occurrence of delusions of grandiosity could suggest that the formation of exaggerated beliefs about one's powers and abilities is a form of protective self-enhancement through which individuals attempt to bolster a more fragile underlying sense of self.⁴⁹ In accordance with the second approach, it is conceivable that individuals' who have negative core beliefs about their abilities and personal strengths⁵⁰ (eg, "I am worthless," "I am weak") will develop delusions whose contents reflect a sense of vulnerability and susceptibility to the control and influence of others through "possession/thought insertion," or directive messages via the television or radio. Importantly, recent ESM research has shown that fluctuations in self-esteem are prospectively associated with the onset, severity, and duration of subsequent paranoia,^{51,52} and it would be of great interest to examine whether variability of self-esteem (as opposed to baseline level) is also linked to the delusional subtypes examined in the current study.

It is important to consider that what we defined as the occurrence of short-lived delusional experiences may actually be instances of increased awareness of an underlying belief system. In this scenario, negative emotional states, hallucinations, reasoning, and negative self-esteem may be factors that contribute to determining the fluctuating threshold of awareness of a sustained internal state or vulnerability. Perhaps the thresholds for delusions of control and reference are more situation or stimulus-driven, impacted by interactions with others or exposure to triggers such as TV programming that individuals misinterpret or respond to. Delusions of grandiosity, on the other hand, may represent a more stable state of mind with a particular narrative organization that is influenced by past life experiences or bizarre ideas and thus less associated with contextual triggers. This might explain why delusions of grandiosity were not associated with any of our time-varying variables.

We also examined a number of delusional dimensions in subsamples of individuals who experienced delusions during the week; hallucinations, anxiety, and reasoning style

were prospectively associated with the level of belief conviction in delusions of reference and control. Interestingly, a lack of hallucinations predicted increased belief conviction for these delusions. Future research could examine whether hallucinations play a dual role here; initially activating cognitive mechanisms that attempt to make sense of the anomalous experience, but when ongoing, serve as a “red flag” for individuals to realize that illness-related processes are taking place, thus preventing them from strongly sustaining these beliefs over time.

The levels of distress from delusions of control were associated with levels of sadness experienced in the prior hours. This finding highlights the interplay between negative affect and the subjective experience of delusions and is very consistent with a growing literature that proposes reexamination of the conceptual separation between emotional and psychotic processes.^{16,28,53–55} None of the risk factors examined were significant predictors for levels of distress associated with delusions of reference and grandiosity. However, this finding was not a statistical artifact due to reduced variance associated with participants not experiencing much associated distress, as ratings across participants were quiet variable. Additional research into these delusional dimensions is necessary to identify other possible predictors of distress.

Similar to our findings regarding delusional conviction, a lack of hallucinations in the previous hours was associated with greater disruption to activities by delusions of control and reference. Sadness and anxiety were also associated with the level of disruption associated with delusions of control, while only anxiety was associated with the disruption of delusions of reference. Reasoning style also predicted the levels of disruption to activities by delusions of reference. Perhaps people who tend to “jump to conclusions” hastily make decisions that delusional symptoms will invariably prevent them from resuming their activities. Conversely, it is possible that both a less thorough reasoning style and a tendency to allow delusions of reference to disrupt activities are actually proxies of another underlying factor—low tolerance for frustration; when faced with a difficult assignment or a symptomatic challenge, some people may find it hard to stay on task, regardless of whether this takes the form of probabilistic calculations and sustained attention in a laboratory test or daily activities in one’s naturalistic settings.

Implications

The occurrence of each delusion subtype was associated with a different combination of factors. These data support the notion that different mechanisms may be involved in the formation/activation of different delusional beliefs.⁴⁵ Consequently, clustering all delusion subtypes into broad “positive symptom” composite outcome scores as is often done in clinical studies may lack the specificity needed to best inform targeted research and treatment development.

The findings of the present study may contribute to emerging interventions by identifying variables that may prove to be important targets in individualized treatments of psychosis. For example, our data suggest that although anxiety might not play a role in the prevention of the occurrence of delusions of control altogether, it may prove to be relevant for reducing these delusions’ level of conviction and disruption to daily activities. Inclusion of functional dimensions such as “disruption to activities” is meant to help inform treatment models that emphasize not only “curative” approaches and symptom reduction but also facilitation of “recovery”—a process in which individuals work to manage their illness and lead rewarding lives, even in the context of ongoing symptoms.^{56–60}

Delusional experiences in our study were dynamic. Even participants who reported higher frequency of delusions did not usually experience them consistently throughout the week and typically provided different conviction, distress, and disruption ratings at each measurement. Momentary experiences of hallucinations and negative emotional states measured in vivo proved to be significant predictors of dimensions of delusions of control and reference. Therefore, interventions that can enhance patients’ ability to identify and respond to real-time contextual risk factors may be warranted for these delusion subtypes. Our investigative team is currently working on the development of a Mobile Assessment and Therapy for Schizophrenia (MATS) platform that has produced some promising preliminary results⁶¹; using cellular phone technologies, individuals engaged in MATS are trained via personalized text messages to utilize cognitive-behavioral strategies to reduce the negative impact of symptoms, as well as challenge dysfunctional automatic thoughts about socialization and antipsychotic medication adherence when they occur in daily life.

Limitations

Results of the analyses examining delusional conviction, distress, and disruption were based on the smaller subsamples of individuals who endorsed experiencing delusions and should therefore be interpreted with caution. Future studies should attempt to replicate these findings with larger samples, in addition to investigating other factors suggested by psychosocial theories of psychosis that were not examined in this study: attributional biases, Theory of Mind dysfunction, belief flexibility, interpersonal functioning, trauma, negative life events, and insight into symptoms and illness.^{17,26,46} In addition, our data collection depended on participants’ introspection and self-report which may be inaccurate or biased. Moreover, our ESM question items were relatively narrow and did not cover the full range of possible themes for delusions of control reference and grandiosity. Unlike hallucinations where individuals are often aware of the fact that anomalous sensory experiences are taking place,^{62,63}

we did not expect individuals to always have insight into the occurrence of irrational beliefs. Therefore, we decided to query about specific subject matter common to delusions in schizophrenia. ESM research requires participants to complete questionnaires in their own environment, while they may be engaged in other activities. Therefore, the trade-off between the breadth of information collected and study burden is compounded. In order to cover multiple domains without excessively taxing our participants at each assessment point with more follow-up questions (likely resulting in lower study compliance rates later in the week), we opted to devote less items to each delusional subtype. Consequently, it is likely that the actual number of people who experienced delusions of control, reference, and grandiosity, more broadly defined was higher than reported.

It is important to note that our research strategy was somewhat of a departure from typical ESM designs which usually incorporate more frequent and random signaling. To date, only few studies have used computerized ESM measures in individuals with schizophrenia, and we were uncertain whether our participants would have difficulty complying with a more labor-intensive protocol. Concerning random vs fixed assessments, either may be justified depending on the goals of a given study. We chose to use fixed assessments because we wanted participants to summarize their symptomatic experiences over approximately equal intervals. Although our approach is undoubtedly not without its limitations, we believe that it provides an important window into dynamic, real-world phenomena that has great utility in supplementing traditional cross-sectional or other laboratory-based psychopathology research methods.²¹

Finally, our methodological control for concurrent delusions in the examination of future delusions enabled an exploratory test for prospective relationships in the study, but the associations found should not conclusively be interpreted to be causal. However, the findings of this naturalistic study can serve as the basis for future experimental (eg, assessment of delusional dimensions following laboratory mood induction) and intervention (eg, cognitive restructuring and relaxation training to help reduce delusional disruption to daily activities) research to crystallize these relationships even more.

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References

1. Jaspers K. *General Psychopathology*. 7th ed. Translated by Hoening J and Hamilton MW. Manchester, UK: Manchester University Press; 1963.
2. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders (4th Edition) (DSM-IV)*. Washington, DC: American Psychiatric Association; 1994.
3. Addington J, Addington D. Positive and negative symptoms of schizophrenia: their course and relationship over time. *Schizophr Res*. 1991;5:51–59.
4. Appelbaum PS, Robbins PC, Vesselinov R. Persistence and stability of delusions over time. *Compr Psychiatry*. 2004;45:317–324.
5. Arndt S, Andreasen NC, Flaum M, Miller D, Nopoulos P. A longitudinal study of symptom dimensions in schizophrenia. *Arch Gen Psychiatry*. 1995;52:352–360.
6. Jørgensen P. Course and outcome in delusional beliefs. *Psychopathology*. 1994;27:89–99.
7. Appelbaum PS, Robbins PC, Roth LH. Dimensional approach to delusions: comparison across types and diagnoses. *Am J Psychiatry*. 1999;156:1938–1943.
8. Garety PA, Freeman D, Jolley S, Dunn G, Bebbington PE, Fowler D. Reasoning, emotions and delusional conviction in psychosis. *J Abnorm Psychol*. 2005;114:373–384.
9. Startup H, Freeman D, Garety PA. Persecutory delusions and catastrophic worry in psychosis: developing the understanding of delusion distress and persistence. *Behav Res Ther*. 2007;45:523–537.
10. Garety PA, Hemsley DR. Characteristics of delusional experience. *Eur Arch Psychiatry Neurol Sci*. 1997;236:294–298.
11. Harrow M, Rattenbury F, Stoll F. Schizophrenic delusions: an analysis of their persistence, of related premorbid ideas, and of three major dimensions. In: Oltmanns TE, Maher BA, eds. *Delusional Beliefs*. New York, NY: Wiley; 1988:184–211.
12. Kendler KS, Glazer WM, Morgenstern H. Dimensions of delusional experience. *Am J Psychiatry*. 1983;140:466–469.
13. Brett-Jones J, Garety PA, Hemsley D. Measuring delusional experiences: a method and its application. *Br J Clin Psychol*. 1987;26:257–265.
14. Garety PA, Hemsley DR. *Delusions: Investigations into the Psychology of Delusional Reasoning*. East Sussex, UK: Psychology Press; 1994.
15. Myin-Germeys I, Nicolson NA, Delespaul P. The context of delusional experiences in the daily life of schizophrenic patients. *Psychol Med*. 2001;31:489–498.
16. Birchwood M, Trower P. The future of cognitive behavioural therapy for psychosis: not a quasi-neuroleptic. *Br J Psychiatry*. 2006;188:107–108.
17. Freeman D. Suspicious minds: the psychology of persecutory delusions. *Clin Psychol Rev*. 2007;27:425–457.
18. Kuipers E, Garety P, Fowler D, Freeman D, Dunn G, Bebbington P. Cognitive emotional, and social processes in psychosis: refining cognitive behavioral therapy for persistent positive symptoms. *Schizophr Bull*. 2006;32(suppl 1):S24–S31.

19. Csikszentmihalyi M, Larson R. Validity and reliability of the experience-sampling method. *J Nerv Ment Dis.* 1987;175:526–536.
20. Delespaul P, deVries M. The daily life of ambulatory chronic mental patients. *J Nerv Ment Dis.* 1987;175:537–544.
21. Myin-Germeys I, Oorschot M, Collip D, Lataster J, Delespaul P, van Os J. Experience sampling research in psychopathology: opening the black box of daily life. *Psychol Med.* 2009;39:1533–1547.
22. Kimhy D, Delespaul P, Corcoran C, Ahn H, Yale S, Malaspina D. Computerized experience sampling method (ESMc): assessing feasibility and validity among individuals with schizophrenia. *J Psychiatr Res.* 2006;40:221–230.
23. Granholm E, Loh C, Swendsen J. Feasibility and validity of computerized ecological momentary assessment in schizophrenia. *Schizophr Bull.* 2008;34:507–514.
24. Johnson EI, Grondin O, Barrault M, et al. Computerized ambulatory monitoring in psychiatry: a multi-site collaborative study of acceptability, compliance, and reactivity. *Int J Methods Psychiatr Res.* 2009;18:48–57.
25. Ben-Zeev D, Ellington K, Swendsen J, Granholm E. Examining a cognitive model of persecutory ideation in the daily life of people with schizophrenia: A Computerized Experience Sampling Study. *Schizophr Bull.* 2010; doi:10.1093/schbul/sbq041.
26. Garety PA, Kuipers E, Fowler D, Freeman D, Bebbington PE. A cognitive model of the positive symptoms of psychosis. *Psychol Med.* 2001;31:189–195.
27. Freeman D, Garety PA, Kuipers E, Fowler D, Bebbington PE. A cognitive model of persecutory delusions. *Br J Psychiatry.* 2002;41:331–347.
28. Smith B, Fowler D, Freeman D, Bebbington P, Bashforth H, Garety P. Emotion and psychosis: direct links between schematic beliefs, emotion and delusions and hallucinations. *Schizophr Res.* 2006;86:181–188.
29. First MB, Spitzer RL, Gibbon M, Williams JBW. *Structured Clinical Interview for DSM-IV Axis I Disorders-Patient Edition (SCID-I/P), Version 2.0.* New York, NY: New York State Psychiatric Institute, Biometrics Research; 1995.
30. Kay SR, Fiszbein A, Opler LA. The Positive and Negative Syndrome Scale (PANSS) for schizophrenia. *Schizophr Bull.* 1987;13:261–276.
31. Beck AT, Steer RA. *Manual for the Beck Anxiety Inventory.* San Antonio, TX: Psychological Corporation; 1993.
32. Beck AT, Steer RA, Brown GK. *Manual for Beck Depression Inventory II (BDI-II).* San Antonio, TX: Psychology Corporation; 1996.
33. Garety PA, Hemsley DR, Wessely S. Reasoning in deluded schizophrenic and paranoid patients: biases in performance on a probabilistic inference task. *J Nerv Ment Dis.* 1991; 179:194–201.
34. Lecomte T, Corbiere M, Laisne F. Investigating self-esteem in individuals with schizophrenia: relevance of the Self-Esteem Rating Scale-Short Form. *Psychiatry Res.* 2006;143:99–108.
35. Weiss HM, Beal DJ, Lucy SL, MacDermid SM. *Constructing EMA Studies with PMAT: The Purdue Momentary Assessment Tool User's Manual.* West Lafayette, IN: Military Family Research Institute at Purdue University; 2004.
36. Nugent WR, Thomas JW. Validation of a clinical measure of self-esteem. *Res Soc Work Pract.* 1993;3:191–207.
37. Barrowclough C, Tarrier N, Humphreys L, Ward J, Gregg L, Andrews B. Self-esteem in schizophrenia: relationships between self-evaluation, family attitudes, and symptomatology. *J Abnorm Psychol.* 2003;112:92–99.
38. Haddock G, McCarron J, Tarrier N, Faragher EB. Scales to measure dimensions of hallucinations and delusions: the psychotic symptom rating scales (PSYRATS). *Psychol Med.* 1999;29:879–889.
39. Raudenbush SW, Bryk AS, Cheong YF, Cogdon RT. *HLM 6.08 Hierarchical Linear and Nonlinear Modeling.* Lincolnwood, IL: Scientific Software International, Inc; 2004.
40. Raudenbush SW, Bryk AS. *Hierarchical Linear Models: Applications and Data Analysis Methods.* 2nd ed. Thousand Oaks, CA: Sage; 2002.
41. Garety PA, Freeman D. Cognitive approaches to delusions: a critical review of theories and evidence. *Br J Clin Psychol.* 1999;38:113–154.
42. Maher BA. Anomalous experience and delusional thinking: the logic of explanations. In: Oltmanns TF, Maher BA, eds. *Delusional Beliefs.* New York, NY: Wiley; 1988:15–33.
43. Dudley RE, John CH, Young AW, Over DE. Normal and abnormal reasoning in people with delusions. *Br J Clin Psychol.* 1997;36:243–258.
44. Silverstone PH. Low self esteem in different psychiatric conditions. *Br J Clin Psychol.* 1991;30:185–188.
45. Neale JM. Defensive functions of manic episodes. In: Oltmanns TF, Maher BA, eds. *Delusional Beliefs.* New York, NY: Wiley; 1988:138–156.
46. Bentall RP, Corcoran R, Howard R, Blackwood N, Kinderman P. Persecutory delusions: a review and theoretical integration. *Clin Psychol Rev.* 2001;21:1143–1192.
47. Bentall RP, Kinderman P, Kaney S. The self, attributional processes and abnormal beliefs: towards a model of persecutory delusions. *Behav Res Ther.* 1994;32:331–341.
48. Lyon HM, Kaney S, Bentall RP. The defensive function of persecutory delusions: evidence from attribution tasks. *Br J Psychiatry.* 1994;164:637–646.
49. Raskin R, Novasek J, Hogan R. Narcissism, self-esteem, and defensive self-enhancement. *J Pers.* 1991;59:19–38.
50. Fowler D, Freeman D, Smith B, Kuipers E, Bebbington P, Bashforth H. The Brief Core Schema Scales (BCSS): psychometric properties and associations with paranoia and grandiosity in non-clinical and psychosis samples. *Psychol Med.* 2006;36:749–759.
51. Thewissen V, Bentall RP, Lecomte T, van Os J, Myin-Germeys I. Fluctuations in self-esteem and paranoia in the context of daily life. *J Abnorm Psychol.* 2008;117:143–153.
52. Thewissen V, Bentall RP, Oorschot M, et al. Emotions, self-esteem, and paranoid episodes: an experience sampling study. *Br J Clin Psychol.* 2010; doi:10.1348/014466510X508677.
53. Freeman D, Garety PA. Connecting neurosis and psychosis: the direct influence of emotion on delusions and hallucinations. *Behav Res Ther.* 2003;41:923–947.
54. Guillem F, Pampoulava T, Stip E, Lalonde P, Todorov C. The relationships between symptom dimensions and dysphoria in schizophrenia. *Schizophr Res.* 2005;75:83–96.
55. Häfner H, Maurer K, Trendler G, an der Heiden W, Schmidt M, Könnecke R. Schizophrenia and depression: challenging the paradigm of two separate diseases—a controlled study of schizophrenia, depression, and healthy controls. *Schizophr Res.* 2005;77:11–24.
56. Kern RS, Glynn SM, Horan WP, Marder SR. Psychosocial treatments to promote functional recovery in schizophrenia. *Schizophr Bull.* 2009;35:347–361.
57. Davidson L, Tondora J, Lawless MS, O'Connell MJ, Rose M. *A Practical Guide to Recovery-Oriented Practice: Tools*

- for Transforming Mental Health Care*. New York, NY: Oxford University Press; 2008.
58. Deegan PE. Recovery: the lived experience of rehabilitation. *Psychosocial Rehabil J*. 1988;11:11–19.
 59. Mead S, Copeland ME. What recovery means to us: consumer perspectives. *Community Ment Health J*. 2002;36:315–328.
 60. Peyser H. What is recovery? A commentary. *Psychiatr Serv*. 2001;52:486–487.
 61. Depp C, Mausbach B, Granholm E, et al. Mobile interventions for severe mental illness: design and preliminary data from three approaches. *J Nerv Ment Dis*. 2010;198:715–721.
 62. Schwartz RC. Insight and illness in chronic schizophrenia. *Compr Psychiatry*. 1998;39:249–254.
 63. van Os J, Verdoux H, Maurice-Tison S, et al. Self-reported psychosis-like symptoms and the continuum of psychosis. *Soc Psychiatry Psychiatr Epidemiol*. 1999;34:459–463.