

# The context of delusional experiences in the daily life of patients with schizophrenia

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## ABSTRACT

**Background.** Global characteristics and psychosocial risk factors related to delusions have been identified. The present study extends these findings to the level of everyday functioning, identifying characteristics of delusional moments (DMs) and contextual risk and protective factors for delusional exacerbations in daily life.

**Methods.** Data were collected using the Experience Sampling Method (ESM), a time-sampling technique. Forty-eight chronic patients diagnosed with schizophrenia rated the intensity of pathological symptoms and mood states and described their thoughts and the environmental context during consecutive moments in daily life. Delusions were defined on the basis of self-rated suspicion, preoccupation, feeling controlled, and coded thought pathology. Daily context included current activity, persons present and location. Characteristics of DMs and non-delusional moments (nDMs) were compared, and a multilevel logistic regression model was used to identify contexts that might trigger or prevent DMs.

**Results.** On average, patients experienced delusions less than one-third of the time. DMs were characterized by higher negative affect and lower positive affect. The presence of family or acquaintances decreased the risk of subsequently experiencing a DM, whereas withdrawal from activities increased this risk.

**Conclusions.** Data support the validity of ESM for investigating delusions in schizophrenia. Daily life contexts appear to alter the probability that delusions will occur. Knowledge about such contexts may therefore be useful in helping patients develop better coping strategies and in creating therapeutic interventions that can lessen emotional distress.

## INTRODUCTION

Delusions are complex phenomena that occur in a variety of psychiatric disorders. Together with hallucinations, they are considered the most important positive symptom in schizophrenia (DSM-IV: APA, 1994). In order to design successful interventions, more need to be known about the characteristics of delusions, their variability over time and possible triggering factors.

Research over the last decades has led to the conclusion that delusions represent points along a continuum from normal to highly abnormal patterns of thoughts. In addition, delusional belief systems can be characterized according to a number of separate dimensions (Strauss, 1969). One dimension that is acknowledged to be of central importance is belief conviction, the extent to which an individual is convinced of the objective reality of the thought (Kendler *et al.* 1983; Garety & Hemsley, 1994; Oulis *et al.* 1996). Other dimensions include bizarreness (Kendler *et al.* 1983; Garety & Hemsley, 1994; Oulis *et al.* 1996), subjective distress (Garety & Hemsley, 1994; Oulis *et al.* 1996), obtrusiveness

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and preoccupation (Kendler *et al.* 1983; Garety & Hemsley, 1994) and concern (Garety & Hemsley, 1994). Dimensions of delusions appear to be largely independent of each other and to vary in intensity over time. Garety & Hemsley (1994), for example, showed that the degree of belief conviction and preoccupation could vary considerably over a period of weeks.

Variability over time in delusional dimensions has been described in relation to the effects of therapeutic interventions (Garety & Hemsley, 1994). Other studies have sought to identify precipitating factors that contribute to delusional relapse. These include fear of losing control (Melges *et al.* 1975), insecurity, restriction of freedom, social and sensory isolation and an intolerable injury to self-esteem (Roberts, 1992). To our knowledge, no research has been done on factors in the daily environment that might influence the occurrence of delusions. More empirical research is necessary to clarify 'the cross-sectional and longitudinal vicissitudes and contexts of delusions' (Strauss, 1991). Knowledge of risk and protective factors in daily life could lead to new clinical strategies to diminish the impact of delusions on the quality of life in schizophrenia.

The current study was designed to investigate delusions at the microscopic level of everyday functioning. What are the most characteristic features of delusional moments in daily life and under which specific contextual conditions do delusions occur? Additional aims of the study were to investigate variability in the presence of delusions over hours and days and to identify aspects of daily experience that may precipitate delusional moments. We used the Experience Sampling Method (ESM), which entails the collection of self-report data about thoughts, mood and the context of experiences in the natural flow of daily life (Csikszentmihalyi & Larson, 1987; deVries, 1992). Previous applications of ESM in schizophrenia (Delespaul, 1995) and other psychiatric disorders (deVries, 1992) have demonstrated the feasibility, validity and reliability of the method in these populations. Schizophrenic symptoms such as hallucinations (Delespaul, 1995; Delespaul *et al.* 1998) and flat affect (Myin-Germeyns *et al.* 2000) have previously been investigated with this method.

## METHOD

### Subjects

Sixty-four patients diagnosed with schizophrenia were recruited through clinical and ambulatory mental health facilities in Maastricht, The Netherlands. Of these, 16 patients were unable to comply fully with the research protocol (see ESM, below). The final study sample thus included 48 chronic patients, suffering from a variety of symptoms. Sociodemographic and clinical characteristics of the patient sample are summarized in Table 1. The diagnosis of schizophrenic spectrum disorder was made according to DSM-III-R criteria by the treating psychiatrist. For 38 patients, we obtained additional diagnostic information with the Operational Criteria Checklist (OPCRIT) (McGuffin *et al.* 1991); the OPCRIT diagnostic categories (DSM-III-R) were as follows: schizophrenia ( $N = 34$ ), atypical psychosis ( $N = 2$ ), delusional disorder ( $N = 1$ ) and schizo-affective disorder ( $N = 1$ ).

Table 1. *Patient characteristics*

Sociodemographic variables	
Gender	28 male, 20 female
Age (years)	M = 35 years, s.d. = 7 (range 21–54)
Marital status	17% Married or living together 15% Divorced 68% Single
Living situation	17% Living alone 36% Living with partner or family 47% Living in sheltered home
Work situation	13% Significant household tasks 4% School or regular job 56% Unemployed 27% Sheltered work
Education (highest level attended)	27.5% Elementary school 50% Secondary school 22.5% Higher education
Clinical variables	
BPRS scores	
Delusional thought content	M = 3.3, s.d. = 2.1 (range 1–7)
Hallucinations	M = 3, s.d. = 2.2 (range 1–7)
Flat affect	M = 3, s.d. = 1.5 (range 1–6)
Duration of illness	M = 13 years, s.d. = 8 (range 1–36)
Neuroleptic treatment dosage (haloperidol equivalents)	M = 11.17 mg/day, s.d. = 15.08 (range 0–60)

\* BPRS scores were available for 42 subjects. M, mean; s.d., standard deviation.

Table 2. Description of the ESM measures used

Delusions (dependent variable)	
Preoccupation (R)	'I'm preoccupied by my thoughts'
Suspicion (R)	'My thoughts are suspicious'
Feeling controlled (R)	'My thoughts are being influenced'
Thought pathology (C)	'What am I thinking about at this moment?' (categories: not delusional, delusional)
Thoughts	
Descriptors (R)	'My thoughts are <i>pleasant/normal/clear</i> '
Content (C)	'What am I thinking about at this moment?' (categories: situations, psychological well-being, physical well-being, other, nothing)
Nature (C)	'What am I thinking about at this moment?' (categories: neutral, evaluation, introspection, planning)
Mood	
Negative states (R)	'I feel <i>anxious/angry/lonely/insecure/unwell</i> ' and dislike of activities ('I would rather do something else')
Positive mood (R)	'I feel <i>cheerful/relaxed</i> '
Symptoms	
Auditory hallucinations (R)	'I hear voices'
Visual hallucinations (R)	'I am seeing things that are not real'
Context*	
Current activity (C)	'What am I doing at this moment?' (categories: <u>doing nothing</u> , working (including study and volunteer work) and leisure activities)
Change in activity	Changes between 2 contingent reports (categories: <u>no change</u> , change to doing nothing, starting to work, starting a leisure activity)
Persons currently present (C)	'Whom am I with at the moment?' (categories: <u>nobody present</u> , family and acquaintances, strangers)
Change in company	Changes between 2 contingent reports (categories: <u>no change</u> , transition to being alone, transition to being with family or acquaintances, transition to being with strangers)
Current location (C)	'Where am I?' (categories: <u>at home</u> , network (including familiar places such as family's house and work) and public place (grocery store, transportation, on the street))
Change in location	Changes between 2 contingent reports (categories: <u>no change</u> , change to home, transition to network, transition to public place)

(R) Subject ratings on 7-point Likert-scales (from 1 'not to all' to 7 'very').

(C) Subjects' responses to open questions, coded by research staff.

\* Context variables were dummy coded for the multilevel analysis. For current activity, doing nothing was chosen as the reference group and two dummy variables were created, namely working (coded 1 when working and 0 in all other cases) and leisure activity (coded 1 during leisure activity and 0 in all other cases). The  $\beta$ s for these dummy variables indicate whether there is an increase or decrease as opposed to the reference group. The same principle was used for all other context variables (the reference group is underlined).

Inter-rater agreement (kappas) for activity (0.91), location (0.94) and persons (0.96) (van Eck, 1996).

## BPRS

Within a week after the ESM period, a trained research assistant assessed 42 of the 48 patients with the Brief Psychiatric Rating Scale (BPRS), a semi-structured interview (Ventura *et al.* 1993). The 24 BPRS items are scored on scales ranging from 1 'not present' to 7 'very strongly present'. The items 'unusual thought content', 'hallucinations' and 'flat affect' were used in the current analysis. In a related study in which each BPRS interview was scored by two raters (including the current rater), inter-rater reliability for these three items was high (kappas of 0.75, 0.79 and 0.85, respectively).

## Experience Sampling Method (ESM)

The Experience Sampling Method is random time-sampling, self-assessment technique. Subjects received a digital wristwatch and ESM

assessment forms collated in a booklet for each day. Ten times a day on 6 consecutive days, the watch emitted a signal at unpredictable moments between 7.30 a.m. and 10.30 p.m. After every 'beep', reports of thoughts, moods, current context (activity, persons present, location) and severity of symptoms were collected.

The ESM procedure was explained during an initial briefing session; at the end, subjects completed a practice form to confirm that they understood how to fill in each item. Subjects were instructed to complete their reports immediately after the beep, thus minimizing memory distortions, and to record the time at which they completed the form. During the actual sampling period, research staff contacted subjects frequently by phone to assess whether they were complying with the instructions. All reports completed more than 15 min after the signal were excluded from the analysis. Delespaul

(1995) has shown a drop in the reliability of reports completed after this interval. Of the 16 subjects excluded from the analysis (see Subjects, above), 12 subjects had fewer than 20 valid reports and four subjects had fewer than 20 reports with the items concerning delusions filled in. The remaining 48 schizophrenia subjects each completed an average of 42 valid reports (s.d. = 9).

Open-ended descriptions of thoughts and contexts were coded by the research staff, and the original coding categories were further collapsed prior to statistical analysis. The subset of ESM measures used in the current analysis are summarized in Table 2.

### Definition of delusional moments

Assessing delusions on the basis of self-report can only be done indirectly, as not all psychotic symptoms are recognized as such by chronic schizophrenia patients. Although patients can, for example, distinguish between hearing real voices and verbal hallucinations (Romme *et al.* 1992; Delespaul, 1995), poor insight into delusions (Debowska, 1998; Schwartz, 1998) makes it impossible for patients to report their presence or absence at specific moments in time. Self-report instruments for evaluating delusional thoughts do exist, such as the Personal Questionnaire (Brett-Jones *et al.* 1987; Chadwick & Lowe, 1990; Garety & Hemsley, 1994), but these are not appropriate for repeated administration during daily activities in a large subject sample.

To circumvent these problems, three items intended to assess aspects of mental state that have been directly associated with delusions in schizophrenia (Junginger *et al.* 1992; and DSM-IV, APA, 1994) were added to the ESM booklet. These were 'preoccupation', 'suspicion' and 'feeling controlled', rated on 7-point Likert scales. A cut-off point for each self-rated variable was set at one s.d. above the mean of all patient ratings, with individual ratings above these points considered delusional. The use of conservative cut-off points was intended to reduce false positives and to limit the analysis to relatively severe delusions. A fourth measure of DM was based on descriptions subjects provided of their current thoughts. Responses were coded according to degree of evident thought pathology. Prior to statistical analysis, this variable was dichotomized so that unambiguously ab-

normal thoughts were considered delusional. Interrater reliability for thought pathology, as established in a separate study with three raters, is high ( $\kappa = 0.91$ ).

A delusional moment (DM) was identified if any one of the following four criteria were met: suspicion rating  $\geq 5$  (mean = 2.1, s.d. = 1.8); preoccupation rating  $\geq 6$  (mean = 2.7, s.d. = 2.1); feeling controlled rating  $\geq 6$  (mean = 2.6, s.d. = 2.1); and, thought pathology, thoughts coded as delusional.

The following are examples of reported thoughts and how they were coded: 'I'm thinking about the war factories that have to be built in the underdeveloped regions of outer space' (thought pathology, delusional; content, situation; nature, planning); 'You know it was a conspiracy to get you to the beautician' (thought pathology, delusional; content, situation; nature, neutral); 'I'm thinking about my financial situation' (thought pathology, non-delusional; content, situation; nature, neutral); and, 'I should start doing something else, because all the knitting is not doing me good' (thought pathology, non-delusional; content, psychological well-being; nature, introspection).

### Statistical procedures

#### *Unilevel analyses*

All unilevel analyses were performed with the Statistical Package for the Social Sciences (SPSS). Tests were two-tailed, with significance level set at  $\alpha = 0.05$ , unless otherwise stated.

Three analyses were performed to assess the validity of the ESM definition of DM. First, kappas were calculated per subject to measure agreement among the four dichotomized criterion variables for defining DMs. Kappas that could not be calculated because of a lack of variance in one of the variables were set to 1 if there was a perfect match or to 0 in all other cases. A one-sample *t* test was conducted to test whether the kappas were significantly different from zero. Secondly, the correlations between the frequency of DMs in each subject and the separate BPRS symptom ratings for unusual thought content, hallucinations and flat affect were examined. If ESM-defined DMs are specifically related to delusions and not just to schizophrenic psychopathology, one would expect that  $r$  (% DMs, BPRS unusual thought content)  $> r$  (% DMs, BPRS hallucina-

Table 3. Level of agreement (corrected kappas) among the four criteria used to define DMs†

	Suspicion	Preoccupation	Feeling controlled	Thought pathology
Suspicion	—			
Preoccupation	0.37 (0.43) ****	—		
Feeling controlled	0.37 (0.43) ****	0.28 (0.44) ****	—	
Thought pathology	0.46 (0.41) ****	0.35 (0.41) ****	0.28 (0.44) ****	—
DM	0.51 (0.38) ****	0.25 (0.41) ****	0.51 (0.39) ****	0.35 (0.44) ****

† All variables were scored either 1 or 0, based on the cut-off scores. Mean kappas (s.d.) over subjects are shown.  
\*\*\*\*  $P < 0.0001$ .

tions)  $> r$  (% DMs, BPRS flat affect). Finally, we used an independent sample  $t$  test to compare the frequency of DMs in patients with the same measure in a group of 42 healthy control subjects recruited from the community expecting that patients would have more frequent DMs than controls.

To assess whether specific mood states, contexts, or thought characteristics were associated with DMs, the mean score for each subject on each ESM variable was first calculated separately for DMs and for nDMs. Subject mean scores under each of the two conditions were then compared with a paired  $t$  test.

#### Multilevel analysis: contextual influences on DMs

Multilevel or hierarchical linear modelling techniques (Goldstein, 1987) are ideally suited for the analysis of ESM data (Schwartz & Stone, 1998; Affleck *et al.* 1999), in which repeated ESM observations (beeps) are nested within subjects. The statistical program MIXOR (Hedeker & Gibbons, 1996) for multilevel logistic regression was used to identify triggering or protective factors in the daily environment for DM, a dichotomous outcome variable. To extend the univariate analysis of concurrent relationships, context variables on previous moments ( $t-1$ ) were added in a multilevel model predicting the presence or absence of delusions at the target moments ( $t$ ). All context variables were dummy coded (see footnote to Table 2). Sex, a subject-level variable, was dummy coded '0' for male and '1' for female. The  $\beta$ s are the fixed regression coefficients of the predictors.

The expectation of DM is related to be related to its determinants by the regression equation:

$$\begin{aligned} \text{Log (odds E(DM))} \\ = & \beta_0 + \beta_1 (\text{persons present at 't-1'}) \\ & + \beta_2 (\text{change in company}) \\ & + \beta_3 (\text{activity at 't-1'}) \\ & + \beta_4 (\text{change in activity}) \\ & + \beta_5 (\text{location at 't-1'}) \\ & + \beta_6 (\text{change in location}) + \beta_7 (\text{sex}) + r. \end{aligned}$$

The residual vector  $r$  can be decomposed in two terms, namely  $r_2$  representing the variability in DM per person that is not explained by the predictors and  $r_1$  representing the residual variability in DM. A forward stepwise procedure was used; the predictors were selected on theoretical grounds, using both the significance of the individual weight parameter (using two-tailed significance tests) and the significant improvement of the overall fit of the model (using a likelihood ratio test (Snijders & Bosker, 1999, p. 88)).

By design, this model applies to the subset of DMs (at time  $t$ ) that are preceded (at time ' $t-1$ ') by nDM. Observations at ' $t-1$ ' in which DMs were present or data were missing (i.e. items not completed or when  $t =$  first beep of the day) were therefore excluded from the model, resulting in a reduction of sample size from 2091 to 581 observations.

## RESULTS

### The validity of the ESM definition of delusions

The majority of patients (41 of 48) experienced DMs at some time during the ESM sampling period. With the percentages split according to



Table 4. Comparison of thought characteristics during DM versus nDM\*

	Descriptors†				Content‡				Nature‡			
	Pleasant	Common	Clear	Situations	Psychological well-being	Physical well-being	Nothing	Neutral	Evaluation	Introspection	Planning	
DM	3.6 (1.8)	4.2 (1.6)	4.9 (1.5)	0.26 (0.27)	0.25 (0.28)	0.08 (0.23)	0.05 (0.12)	0.45 (0.33)	0.23 (0.28)	0.13 (0.22)	0.10 (0.19)	
nDM	4.3 (1.2)	4.5 (1.2)	5.3 (1.3)	0.40 (0.20)	0.14 (0.14)	0.05 (0.06)	0.04 (0.13)	0.54 (0.24)	0.27 (0.20)	0.06 (0.08)	0.10 (0.12)	
<i>P</i> <	0.05	NS	NS	0.05	0.05	NS	NS	0.05	NS	NS	NS	

\* Significance levels are for 2-tailed paired *t* tests (*N* = 41).

† Mean ratings (s.d.).

‡ Estimated mean frequency (s.d.) for each category of thought.

each of the four variables used to define DMs, 27 subjects reported suspicion (frequency: mean = 19.1%, s.d. = 24), 31 subjects reported pre-occupation (frequency: mean = 21.8%, s.d. = 23), 29 subjects reported feeling controlled (frequency: mean = 22.4%, s.d. = 22.9) and 27 subjects displayed thought pathology (frequency: mean = 27.6%, s.d. = 26.46). The kappas of association among the criteria for DM are shown in Table 3. All kappas are in the 'fair' to 'moderate' range (Landis & Koch, 1977), which provides evidence that the four criterion measures represent the common construct delusion.

On average, subjects reported DMs 32% of the time (s.d. = 29.8, range 0–100%). Subjects with DM frequency 0% (*N* = 7) or 100% (*N* = 1) were excluded from further analyses. As predicted, the ESM measure 'percentage of time with DMs' was most highly correlated with the BPRS item 'unusual thought content' ( $r = 0.56$ ,  $P < 0.001$ ); DM correlations with BPRS items 'hallucinations' and 'flat affect' were smaller ( $r = 0.36$ ,  $P < 0.02$ , and  $r = 0.18$ , NS, respectively). In addition, the patient group had much more frequent DMs (mean = 32%, s.d. = 29.8) than the healthy control group (mean = 0.15%, s.d. = 0.24;  $t(88) = -6.92$ ,  $P < 0.0001$ ), who rarely reported any DM.

#### Characteristics and contexts of DMs

Table 4 presents characteristics of delusional thoughts as compared to non-delusional thoughts. Subjects rated thoughts during DMs as significantly less pleasant than during nDMs; ratings of thoughts as 'common' or 'clear' were similar, however. While more time was spent thinking about situations during nDMs, thoughts concerning psychological well-being were more common during DMs. Thoughts during DMs tended to be more often introspective ( $P < 0.07$ ), whereas thoughts during nDMs were more often neutral. Other differences were not statistically significant.

With respect to concurrent emotional states and symptoms (see Table 5), DMs were accompanied by significant elevations in negative feelings, including anxiety, anger, loneliness, uncertainty, feeling unwell, and dislike of the current activity. In contrast, positive states (cheerful and relaxed) were significantly lower during DMs. Patients reported more intense

Table 5. Comparison of mood states and symptoms during DM versus nDM\*

	Negative mood†					Positive mood†		Hallucinations†		
	Anxious	Angry	Lonely	Insecure	Feeling unwell	Dislike activity	Cheerful	Relaxed	Auditory	Visual
DM	2.4 (1.4)	2.5 (1.4)	2.6 (1.5)	3.1 (1.5)	2.5 (1.4)	3.3 (1.8)	3.7 (1.4)	3.9 (1.4)	1.8 (1.3)	1.5 (0.8)
nDM	2.0 (1.2)	1.8 (1.0)	2.2 (1.4)	2.4 (1.3)	2.1 (1.1)	2.6 (1.2)	4.2 (1.2)	4.2 (1.2)	1.5 (0.9)	1.4 (0.8)
<i>P</i> <	0.05	0.001	0.05	0.001	0.05	0.05	0.05	0.05	0.05	NS

\* Significance levels are for 2-tailed paired *t* tests (*N* = 41).

† Mean ratings (s.d.).

Table 6. Comparison of contexts during DM versus nDM\*

	Current activity†			Persons currently present†			Current location†		
	Doing nothing	Working	Leisure activities	Alone	With acquaintances	With strangers	At home	Network	Public place
DM	0.17 (0.25)	0.23 (0.25)	0.59 (0.31)	0.36 (0.3)	0.56 (0.32)	0.05 (0.16)	0.62 (0.37)	0.24 (0.3)	0.12 (0.22)
nDM	0.16 (0.2)	0.30 (0.18)	0.56 (0.20)	0.44 (0.24)	0.49 (0.26)	0.04 (0.07)	0.68 (0.25)	0.18 (0.19)	0.12 (0.12)
<i>P</i> <	NS	NS	NS	NS	NS	NS	NS	NS	NS

\* Significance levels are for 2-tailed paired *t* tests (*N* = 41).

† Mean proportion of time (s.d.) spent in this context.

Table 7. Multilevel model estimates for the occurrence of delusions†

Variable	<i>B</i>	s.e. <i>B</i>	<i>Z</i> ‡
Intercept	-1.866	0.480	-3.890***
Beep level			
Persons present at 't-1'§			
Acquaintances	-0.715	0.342	-2.093*
Strangers	0.924	0.523	1.765
Change in activity§			
Transition to doing nothing	1.127	0.455	2.475*
Transition to work	-0.927	0.900	-1.031
Transition to leisure activity	0.374	0.443	0.844
Subject level			
Sex (Male = 1; Female = 0)	0.621	0.772	0.804

† The analysis is based on 581 ESM reports from 36 subjects. Four subjects had no consecutive nDM and DM observations and were therefore excluded from the analysis. The following variables had non-significant effects and were therefore not entered in the forward stepwise procedure: change in company, current activity, location, change in location.

‡ *Z* values are calculated by dividing the estimated regression coefficient (*B*) by its standard error (s.e. *B*).\**P* < 0.05; \*\*\**P* < 0.001.

§ Variable fulfilled = 1; otherwise = 0.

auditory hallucinations (but no difference in visual hallucinations) during DMs. Daily contexts (current activity, persons currently present, current location) were, however, surprisingly similar for DMs and nDMs (see Table 6).

### Contextual triggers of DM

We performed a multilevel logistic regression analysis to clarify the contribution of daily context variables as predictors of DMs. Table 7

presents the estimates obtained. The variables 'activity at 't-1'', 'location at 't-1'', 'change in company' and change 'in location' had no significant main effects.

'Persons present at 't-1'' (roughly 90 min earlier) and 'changes in activity' between moments 't-1' and 't' had the largest effects on the probability of DM occurrence. Being with an acquaintance significantly decreased the risk of experiencing DMs. On the other hand,

withdrawing from activities (i.e. changing from work or leisure at 't-1' to doing nothing at 't') significantly increased the risk of a DM.

## DISCUSSION

### Limitations

Confirmatory OPCRIT diagnoses were not available for 10 subjects. However, these patients, who were recruited through the same facilities and therefore diagnosed by the same psychiatrists as the other 38 subjects, did not differ from the OPCRIT-confirmed group on the BPRS item delusional thought (OPCRIT group, mean = 3.1, s.d. = 2.2; remaining group, mean = 4.3, s.d. = 1.8;  $t(40) = 1.40$ , NS) or on sociodemographic variables such as marital situation or working situation. Furthermore, the two groups did not differ on mean percentage of time with DMs (OPCRIT group, mean = 30%, s.d. = 30; remaining group, mean = 40%, s.d. = 28;  $t(46) = -1$ , NS).

Due to the complexity of ESM, a number of patients were unable to comply adequately with the research protocol and were later excluded from the analysis. The mean percentage of time with a DM did not differ, however, in excluded versus included subjects (36% v. 32%;  $t(62) = -0.46$ , NS), which suggests that the included sample was representative of all patients who entered the study.

### ESM definition of delusions

The validity of the ESM definition of delusions is crucial to the interpretation of the results. The three ESM self-report items used to define DMs are conceptually related to two of the identified dimensions of delusions in schizophrenia (Strauss, 1969), namely delusional content and preoccupation, which lends face validity to the ESM operationalization. Furthermore, the fourth criterion (thought pathology, as evaluated by an independent coder) showed significant associations with each of the three self-report criteria. This strengthens the case for assuming that all four variables represent the same underlying construct and reduces the possibility that associations among the self-report variables are due to shared method variance alone. The positive correlation between frequency of DMs and BPRS scores and the virtual absence of

DMs in a group of healthy controls lend additional support to the validity of the ESM definition of delusions.

### Characteristics and contexts of delusional experiences

Previous studies have shown that certain dimensions of delusions vary over periods of weeks or months (Brett-Jones *et al.* 1987; Garety & Hemsley, 1994) and that the frequency of delusions can be modified by therapeutic intervention (Chadwick *et al.* 1994). Our data confirm that patients diagnosed with chronic schizophrenia are not involved in delusional thinking all day long. The majority of patients had many moments on which delusions were either totally absent or only weakly present.

In the literature on cognitive behaviour therapy (CBT) for psychosis (Fowler *et al.* 1995), emotional disturbance is recognized as a central aspect of psychosis; unhappiness and worry have been found to be associated with delusional beliefs (Garety & Hemsley, 1994). The current study replicates these findings in daily life. Negative affect might be related to the introspective, self-orientated nature of thoughts during DMs (Garety & Hemsley, 1994). In an ESM study of healthy individuals, for example, self-referential ideas were accompanied by increased negative affect and decreased motivation (Csikszentmihaly & Figurski, 1982). It is not yet clear, however, whether negative feelings cause self-referential ideas and delusional beliefs, or vice versa (Fowler *et al.* 1995).

The main goal of contemporary interventions is the reduction of distress and disability associated with symptoms and their attributions (Tarrier, 1992; Sensky *et al.* 2000), for example using Socratic questioning (Rutter & Friedberg, 1999) or reinforcement strategies (Corrigan & Storzbach, 1993). Finding ways to limit the time spent in delusional thinking might be another valuable therapeutic approach. To this end, factors related to the onset of DMs in daily life need to be identified.

### Contextual triggers of delusional experiences

The multilevel analysis indicated that aspects of the daily life context were significant predictors of delusion onset within approximately 90 min. More specifically, the presence of acquaintances



and family members appeared to be a protective factor. The same has been reported in some expressed emotion (EE) studies. Although EE research has mainly focused on the increased risk of psychotic relapse when high EE family members are present (Brown *et al.* 1972; Vaughn & Leff, 1976), some studies have also shown that warmth in low EE family members can have a protective function (Bebbington & Kuipers, 1994; Ivanovic *et al.* 1994). Unfortunately, in the current study no information was available about the high/low EE nature of the relationships with the persons present; however, the fact that patients rated the company of those present as moderately pleasant (mean = 5.5, s.d. = 1.3 on a 7-point scale) lends some support to the protective function of positively evaluated social contacts. Similarly, Jorgensen & Aagaard (1988) found that frequent social contacts predicted good outcome in patients suffering from delusions. The social interaction with family members might serve as a normalizing force as it continually confronts patients with reality.

The other contextual variable with a significant effect in the multilevel model was transition from involvement in an activity to doing nothing, which increased the risk of experiencing a DM at the next moment. Inactivity has long been acknowledged as a factor contributing to poor outcome in schizophrenia (Wing & Brown, 1970; Curson *et al.* 1992). Indeed, an implicit rationale for vocational therapy is to avoid the danger of inactivity (Lehman, 1995). To date, changes in activity have not been studied as a precipitating factor, but they have been recognized as important in attempts to reduce or control psychotic symptoms once present. Breier & Strauss (1983), for example, showed that some schizophrenia patients can control the intensity of their psychotic symptoms by either increasing or reducing their involvement in activities. Falloon & Talbot (1981) have described the importance of increasing activity in reducing auditory hallucinations. Although we were unable to find any significant relationship between increasing activities and a reduced probability of delusional experiences in daily life, we did find a positive relation between a reduction in activities and the presence of DMs. Apparently, a withdrawal from activities is a risk factor in daily life for delusional relapse. One should keep in mind, however, that the causal direction of temporal

associations in ESM data cannot be firmly established.

Beyond its usefulness in research, the ESM could prove to be a useful tool in clinical practice, especially in the framework of CBT (Fowler *et al.* 1995; Kuipers *et al.* 1997; Haddock *et al.* 1998). The general approach in CBT for psychotic disorder is based on working towards a collaborative understanding of the development of symptoms and the reduction of distress and disability. An important part of the therapy includes the examination of the antecedents of the emergence of the psychotic disorder, which will aid in developing a normalizing rationale. Our results suggest that ESM data may be helpful in assessing such antecedents, as well as the degree of distress and disability associated with symptoms in daily life. Guided discovery followed by graded homework tasks are also important elements in CBT for delusions (Sensky *et al.* 2000). This process could be aided by ESM, providing the therapist with a means to discuss the occurrence of delusional thinking in the context of the patient's actual daily experience.

Finally, ESM could prove useful in the context of clinical trials evaluating the effects of behavioural or pharmaceutical treatments on the frequency and severity of delusions, among other symptoms of schizophrenia.

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