

Is poor social functioning of patients with psychosis a result of inability to transfer social reward value to future situations?

The Experience Sampling Method study¹

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Abstract

Background: Poor social functioning is one of the main features of psychosis. It usually escalates over the course of the disorder and it is very resistant to treatment. A possible reason for poor social functioning in patients with psychosis is impaired reward sensitivity. The aim of this study was to investigate the extent to which positive affect experienced in social company leads to social engagement in the immediate future, and whether this pattern of consummatory experience informing social behavior differs between patients and controls.

Method: Patients with diagnosed psychotic disorder (N=46) and healthy individuals (N=54) participated in Experience Sampling Method (ESM) data collection. Data were collected 10 times per day for 6 consecutive days. The measures of interest were momentary positive affect (PA) and the subjectively rated pleasantness of company in everyday life.

Results: Patients experienced higher levels of PA while in the company of others than did controls, even when the pleasantness of company was rated »low«. Somewhat surprisingly, pleasantness of social company and PA while in company (t-1) were not predictive of future engagement in social company (t) in neither one of the two groups.

Conclusion: This study suggests that positive experience during social company does not predict being in similar situations in the immediate future for either group. Based on these results, altered reward learning is not specific for psychotic patients, but is also observed in healthy controls. However, some methodological issues of the current study could be the reason for such findings. Therefore, future studies should further investigate reward learning in patients with psychosis.

Keywords: psychosis, social functioning, experience sampling method, reward sensitivity, positive affect, company pleasantness

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Background

Experience Sampling Method (ESM) is a structured diary technique used to study participants in their everyday life (Larson & Csikszentmihalyi, 1983). It is a systematic self-report tool that collects data multiple times per day for several consecutive days. Depending on our variables of interest, we can assess participants' activity, mood and appraisal of the current situation. The data collected with this method allow us to study dynamic person-environment interactions (Myin-Germeys, Oorschot, Collip, Lataster, Delespaul & van Os, 2009). There are many advantages to the ESM compared to retrospective data collection or interviews. ESM assesses in-the-moment experience and is therefore less prone to memory biases (Myin-Germeys, et. al., 2009). Furthermore, longitudinal data collection allows us to study fluctuations of our variables of interest over time (Kimhy, Delespaul, Corcoran, Ahn, Yale, Malaspina, 2005). During the ESM data collection, participants carry an electronic pager. Participant completes the questionnaire at the moment when the pager gives a signal. Usually, data are collected 10 times per day for 7 consecutive days. The times of signals are random, but we can define the starting time, end time and the breaks between two signals (Myin-Germeys, et. al., 2009). In first ESM research, participants carried a wristwatch that gave the signal, and the questionnaires were in the pen-and-paper format (Larson & Csikszentmihalyi, 1983). The pen-and-paper format was later replaced by electronic devices (Kimhy, et. al., 2005). The most recent development is the mobile applications.

In the current study, ESM was used to explore the possible underlying deficit of poor social functioning in patients with psychosis. Poor social functioning is one of the core features of psychosis (APA, 2000). It is manifested as social withdrawal, poorer interpersonal communication, greater dependency and hesitation to begin social interactions (Addington, Penn, Woods, Addington, & Perkins, 2008). Recently, growing interest in reward processing in patients with psychosis is paving the way for a new perspective on the possible underlying mechanisms of poor social functioning; a comprehensive review by Deserno and colleagues (2013) suggested a causal role for impaired reward sensitivity in diminished goal-oriented behavior in schizophrenia (Deserno, Boehme, Heinz, & Schlagenhauf, 2013). Reward learning was previously shown to be altered in patients with psychosis (Waltz, Frank, Robinson, & Gold, 2007), and therefore presents as

an important research topic. The purpose of this study is to investigate whether there is a connection between reward processes and impaired social functioning in psychosis.

Social functioning is a construct of many different behaviors. Some of the most important are engagement in social company (e.g. having friends, being in a partner relationship, ...), adjustment to social norms and behaviors, independence from others, communication, and pro-social behavior (e.g. attending cultural and entertaining events, visiting other people, ...). Poor social functioning leads to social isolation, which is characterized by lack of contact with other people and it is closely related to social anhedonia, which is a lack of pleasure when in the company of others. Social functioning is already impaired in individuals with ultra-high risk (UHR) for psychosis before the onset of the illness (Addington, et al., 2008). Specifically, UHR individuals exhibit similar difficulties in interpersonal communication and social withdrawal as individuals who are already diagnosed with psychosis, meaning that their interpersonal communication is poorer and they have less social relationships (Addington, et al., 2008). A study by Dragt and colleagues (2011) found that social maladjustment, characterized by low sociability and social withdrawal, poor peer relationships, inability to function outside immediate family and inability to form intimate relationships, predicts development of psychosis in UHR individuals (Dragt et al., 2011). In addition to this, onset of psychosis further increases social isolation (Killaspy et al., 2013) through stigma and self-stigma. Stigma leads to social isolation because of stereotyping and avoiding people with the diagnosis of mental illness, while self-stigma triggers the feeling of being different and expectations of being rejected (Vauth, Kleim, Wirtz, & Corrigan, 2007). Reduced productivity in the working environment that often results in job loss is also responsible for decreased social contact (Killaspy, et al., 2013). Another contributing factor in poorer social functioning is the reduced ability of UHR individuals to live independently and their greater dependence on social services when compared to the healthy population (Fusar-Poli et al., 2010). A key concern with social withdrawal is its relative stability and resistance to treatment (Cornblatt et al., 2007). Therefore, impaired social functioning is a very rigid phenomenon that affects people at risk of psychosis, as well as people with the disorder. Its pervasive nature and resistance to treatment are another reason why

underlying processes should be investigated and addressed in treatment.

A possible underlying deficit that leads to poor social functioning is inability to anticipate social reward from future social activities. Social reward is characterized as experience of pleasure and positive emotions when in the company of others (Collip, et al., 2013). Studies have shown that patients with schizophrenia show impaired learning from rewarding outcomes whereas learning to avoid losses is intact (Waltz, et al., 2007). Reward learning processes were shown to be especially affected in patients with more severe negative symptoms (Gold et al., 2012). The same study showed that patients with high levels of negative symptoms are unable to consider expected reward when making decisions (Gold, et al., 2012). This finding contributes to our understanding of diminished social functioning in patients with psychosis. If the patients cannot take into account previous positive experience during momentary social interactions, it may lead them to withdraw from social situations. This idea can be further supported by studies, which found that patients with psychosis suffer from anticipatory anhedonia (Gard, Kring, Gard, Horan, & Green, 2007). Anticipatory anhedonia is characterized by the absence of positive expectations from future events and the absence of pleasure while expecting future events. Interestingly, despite diminished anticipatory pleasure, patients show intact »in-the-moment« experience of pleasure when engaging in pleasant activities, labeled as »consummatory pleasure« (Gard, et al., 2007). Importantly, anticipatory pleasure influences our goal-directed behavior through motivational processes (Dickinson & Balleine, 1995). Therefore, the absence of experience of such pleasure can explain why patients lack motivation and action to seek out pleasant experiences.

While social withdrawal is clearly a major problem in patients with psychosis, the question remains, what are the underlying mechanisms that lead the patient to solitude? The aim of this study is to investigate the extent to which positive affect experienced in social company leads to social engagement in the immediate future, and whether this pattern of consummatory experience informing social behavior differs between patients and controls.

Method

The data used in this study are a subset of existing data collection of MHeNS School of Mental Health and Neuroscience, Department for Psychiatry and Psychology at Maastricht University. It is an observational study and all participants underwent the same procedures. In this study, the Experience Sampling Method (ESM) was used.

Participants: Participants were divided into two groups; patients and controls. Inclusion in study was open to adults between 18 and 50 years old, with sufficient command of the Dutch language and no intellectual impairment (IQ>80). Cannabis and alcohol dependence were additional exclusion criteria. The final sample consisted of 100 participants. In the patient group 21 female and 25 male participants were assessed. The average age of participants in the patient group was 42.53 years. The second group consisted of healthy individuals without any lifetime or family history of psychosis. The control group comprised of 27 female and 27 male healthy participants, with an average age of 39.84 years.

Experience Sampling Method: ESM is a structured diary technique used to study participants in their everyday life. Participants received a digital wristwatch and a set of ESM self-assessment forms. Every day a wristwatch sounded a series of alerts to the patient to remind him/her to fill in the questionnaires. The moments at which the signal sounded were random. The signal was given 10 times between 7:30 and 22:30 for 6 consecutive days. The questionnaires that participants had to fill in assessed their current situation/activity and their appraisal of it, psychopathology and mood. All questions used a 7-point Likert scale. Additional questions were filled in just after awakening and in the evening before going to sleep. The questions of interest for this study assessed the positive mood of the participants with the following items: I feel cheerful, relaxed, satisfied and generally well. The questions that followed concerned where the participant was at that particular moment and whether he/she was alone or in the company of others. If the participant was in the company of someone else, he/she was then asked to tell who he/she was with, and the number of men, women and/or children in his/her company. The next block of questions assessed how the participant felt in this company. The items were: relaxed, judged, threatened, accepted and »I would

prefer to be alone«. Each one of these scales was evaluated using a 7-point Likert scale (1=not at all, 4=moderate, 7=very).

Social reward was previously operationally defined as the ability to experience PA and pleasure with positive social experiences (e.g. Collip et.al, 2013). Therefore, PA and pleasure associated with social company were used as variables of interest. Based on a principal component factor analysis (orthogonal varimax rotation) of the positive mood items, positive affect (PA) was calculated as a mean score of the following items: cheerful (Rotated factor loading=.83), relaxed (Rotated factor loading=.79), satisfied (Rotated factor loading=.78) and generally well (Rotated factor loading=.85). *Company pleasantness* was measured using a mean of scores on selected items evaluating the current social event. The items with a negative valence were reverse-coded (in order for high scores to reflect pleasantness instead of »stressfulness« of the company) prior to the factor analysis. Items that loaded on the same factor and formed event pleasantness were: relaxed (Rotated factor loading=.80), judged (reversed) (Rotated factor loading=.63), threatened (reversed) (Rotated factor loading=.58), accepted (Rotated factor loading=.70) and would prefer to be alone (reversed) (Rotated factor loading=.63).

Analysis: To investigate the association between company pleasantness/ PA and future engagement in social company, multilevel linear time-lagged regression analysis was performed using the STATA/MP 13.1 (StataCorp, 2013) program. The association was investigated by looking at two consecutive time-points. In this way it was determined whether there is an association between behavior at time point *t* and PA/ pleasantness experienced in the context of that behavior at time point *t-1*.

Results

A total of 100 participants were included in the final analysis, in which the mean number of valid beeps per subject was 45 in the control group and 48 in the patient group.

While controls spend approximately 38.7% of their time alone, patients spent 47.2% of their time alone. A *t*-test showed that this difference is significant ($t(98)=-2.46, p<0.05$), indicating that during the ESM week, patients spent significantly more time alone than controls.

Patients report more PA at lower levels of company pleasantness than controls. In addition, their PA increases less following an increase in company pleasantness than in controls. However, the mean value for company pleasantness is 6.37 (SD=.74) for controls, and 6.06 (SD=.97) for patients. Additionally, cumulative frequency of values from 1 to 5 (inclusive) is 10.36, which means that only 10.36% of the data points are under the value of 5 (including 5). Therefore, this trend could be due to a lack of observations at low company pleasantness, with fewer values leading to an over-estimation of the apparent group difference at the extreme low level.

Company pleasantness at *t-1* and PA at *t-1* did not have a significant effect on being in social company at *t* ($\beta=.237, z=.45, p>.05$ and $\beta=.255, z=.38, p>.05$ respectively). There was also no significant main effect of group ($\beta=1.342, z=.33, p>.05$). The three-way interaction between company pleasantness and PA, both at *t-1* and group also did not show a significant effect on being in the company of others at *t* ($\beta=.042, z=.31, p>.05$). These results suggest that being in a pleasant company and experiencing positive emotions does not lead to future engagement in social company. The same was observed for both - patients and controls.

Discussion

Given that impairments in social functioning were found in psychotic patients (APA, 2000), the first aim of this study was to explain them by investigating whether patients with psychosis experience the same consummatory pleasure as controls when being in pleasurable company. Analysis showed that patients experience higher PA than controls at lower levels of »company pleasantness«. PA increases with the increase of »company pleasantness« in both groups, but more rapidly in the control group. Studies have shown that patients with schizophrenia experience the same consummatory pleasure as controls (Gard, et al., 2007), which is in line with the current findings. This means that patients experience the same amount of pleasure during pleasant daily activities as controls. In addition to this, patients« positive emotions vary less than in controls (Myin-Germeys & Delespaul, 2000), which may explain why higher levels of PA are already observed at lower levels of pleasantness in social company. Another possible

explanation is that patients are simply less able to detect subtle differences in PA. It could also be that patients can enjoy less pleasurable events more so than controls because being in company of others is a relatively greater enrichment of their everyday environment given that they spend significantly more time alone than controls. However, higher levels of PA at lower levels of company pleasantness can also be a consequence of the fact that the mean »company pleasantness« for both controls and patients was above 6 on a 1-7 Likert scale, pointing to a ceiling effect. Therefore, this finding might be a result of low statistical power due to small amount of observations at lower levels of company pleasantness.

The second major goal of this study was to determine whether patients fail to learn from pleasant experience. If this were the case, consummatory pleasure would only predict future engagement in similar situations in the control but not in the patient group. This was investigated by looking at engagement in social company in ESM responses subsequent to prior episodes of consummatory pleasure during social encounters. It was found that PA and »company pleasantness« at t-1 did not predict future acts of being in the company of others. The findings did not differ between patients and controls. These results suggest that a positive experience does not encourage people to engage in similar situations in the future. Contrary to the hypothesis, the current study found no evidence of transfer of reward values to future situations. One of the reasons for such results might be that high PA is a consequence of something other than pleasant company at the time of measurement. The questionnaire used in the ESM did not specifically ask about the participant«

s positive emotions related to the current social company, meaning that the reported PA could be associated with something else (e.g. something that happened before the alert, something the participant was looking forward to, ...). Furthermore, it is plausible that the items that were intended to assess company pleasantness may have in fact measured some other property, since they were initially constructed to measure social stress, which is somewhat different. Namely, two of the items described company as threatening and judgmental. The guidelines for use of ESM recommend using items that fluctuate across time (Oorschot, Kwapil, Delespaul, & Myin-Germeys, 2009). However, it is possible that being threatened or feeling judged when in company of others is not necessarily present to varying extents in most social encounters. More likely, these are experiences limited to restricted situations only. In the sample of this study participants on average evaluated their company as very pleasant, possibly reflecting their decision not to choose extremely negative descriptions of their company. This may mean that evaluation of social company as very pleasant reflects avoidance of extreme negative evaluations, rather than being a reflection of actual pleasantness of the company. This could explain why pleasant experience did not predict future acts of being in social company.

To conclude, this study confirmed impaired social functioning in patients with psychosis, but no evidence for differences in reward-learning between patients and controls was found. However, some methodological issues of the current study could be the reason for such findings. Future studies should further investigate reward learning and the underlying dopaminergic system in patients with psychosis.

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