



Immediate affective motivation is not impaired in schizophrenia



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ABSTRACT

Background: Among the various cognitive and affective evaluations that contribute to decisions about whether to engage in a future activity, three affective evaluations are particularly relevant: 1) interest in the activity itself, 2) the pleasure anticipated from the activity and 3) the excitement experienced while looking forward to the activity. In addition to these pre-activity evaluations, affective evaluations that are done after the activity is completed impact people's motivation to repeat the same activity. Although extant research suggests that these affective processes may be impaired in schizophrenia, it is not clear whether these impairments are mostly secondary to cognitive deficits.

Method: In three independent studies utilizing simple laboratory tasks with minimal cognitive demands, patients with schizophrenia or schizoaffective disorder and healthy control subjects evaluated their pleasure, interest, and excitement immediately before and after completing the tasks.

Results: Patients' anticipated pleasure and posttest evaluations of pleasure and interest were significantly greater than controls'. No group differences were found for excitement. In patients, there were significant negative correlations between anticipated pleasure, pretest excitement and depression scores, and between pretest interest and negative symptoms.

Conclusions: In these experiments, immediate affective evaluations reported by participants with schizophrenia or schizoaffective disorder were greater or similar to controls'. This finding is consistent with recent affective research showing that experiences of pleasure are intact in schizophrenia. These results emphasize the need to disentangle affective from cognitive processes in order to better understand the complex impairments present in schizophrenia spectrum disorders.

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1. Introduction

Our decisions to engage in activity are guided (at least in part) by cognitive and affective evaluations (Kuhl, 2008). These affective and cognitive evaluations are combined to form a subjective motivational value, associated with a future activity, and guide the decision to approach the activity or not. Among these motivational attributes, three affective evaluations are of particular importance: anticipated pleasure, interest, and excitement (Izard and Ackerman, 2000; Frijda, 2004). Anticipated pleasure is the degree to which individuals evaluate the pleasure they will experience from an upcoming activity. Interest is a primary emotion (Izard and Ackerman, 2000; Silvia, 2005), and is different from enjoyment or pleasure (Silvia, 2005). Interest is part of the intrinsic motivation concept, and may be a better predictor of actual

engagement than anticipated pleasure (Berlyne, 1974). Excitement reflects an individual's current positive arousal level and eagerness to engage in an activity (Alcaro and Panksepp, 2011).

Different theories have emphasized the dynamic aspect of these affective evaluations. Consistent with Reinforcement Learning Theory (Dayan and Niv, 2008) and Decision Theory (Kahneman et al., 1997), research has demonstrated that evaluations of pleasure before and after an activity are often enhanced compared to the in-the-moment reports of the pleasure experienced during the activity ("consummatory pleasure"). Moreover, pre- and post-activity evaluations of pleasure are highly correlated, suggesting that people use posttest evaluations when they anticipate the pleasure they will have from repeating the same activity.

Motivation is severely impaired in people with schizophrenia and greatly contributes to their poor functioning (Foussias et al., 2009; Gard et al., 2009). Recently research has examined which components of motivation are impaired in schizophrenia. Kring (1999) introduced the distinction between anticipatory and consummatory pleasure in schizophrenia research, and hypothesized that anticipatory not

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consummatory pleasure is impaired in schizophrenia. This led to the development of a new self-report scale to measure anticipatory pleasure (Gard et al., 2006). However, responses to most items of this scale require various cognitive processes such as self-knowledge or episodic memory. Group differences with this kind of affect scale may reflect cognitive rather than affective differences (Strauss and Gold, 2012). In an event sampling study (Gard et al., 2007), participants were asked to rate the pleasure that they anticipated from future activities in their usual life setting. Patients reported less anticipated pleasure from goal-directed activities (such as making dinner, working) than controls, but not from non-goal-directed behaviors (such as eating, smoking). Goal-directed activities require effort, and people with schizophrenia are impaired in the evaluation of effort cost of future activities (Fervaha et al., 2013; Gold et al., 2013). People with schizophrenia may anticipate more effort and consequently look forward to those goal-directed activities less than controls (see also Fervaha et al., 2014). Here again, it appears that group differences may reflect differences in cognitive evaluations and not in affective processes. Consequently in order to specifically study affective processes in schizophrenia, it is necessary to use tasks with minimal cognitive demands, as was done in the present study.

People with schizophrenia are often clinically described as poorly motivated and lacking interest. Consequently, rating scales measuring symptoms (Andreasen, 1989), trait motivation (Heinrichs et al., 1984; Marin et al., 1991), or task-specific intrinsic motivation (Choi et al., 2010), included items relating to interest. However, interest has often been combined with or understood as enjoyment/pleasure (as in our own previous paper (Trémeau et al., 2010)), and specific or individual reports on interest are missing in schizophrenia research. Interest is particularly important because, as stated above, it may be more related to motivation than pleasure.

We know of only one study that examined self-reported excitement (positive arousal) before the onset of a task (Waltz et al., 2010). In that study, a modified monetary incentive delay task was used, patients and controls rated their arousal on a bipolar scale (from negative arousal/anxiety to positive arousal/excitement) before responding to the target cue. No group differences in excitement scores were observed for gains and losses.

The current series of studies are to our knowledge the first attempt to clearly differentiate pleasure, interest, and excitement in schizophrenia. We examined these three aspects of affective motivation before and after the completion of computerized laboratory tasks in three independent studies (results on task performances are reported elsewhere), which have a low cognitive load. We reasoned that apparent lack of interest and impaired anticipation in schizophrenia might be secondary to cognitive deficits, and we hypothesized that people with schizophrenia's affective motivational evaluations are not impaired when cognitive demand is low, as in the present study.

2. Methods

2.1. Participants

We conducted three independent studies with different samples. In each study, participants were asked to make affective ratings before and after completing a computerized task (different in each study). In each study, the task was described to the participants before they were asked to make the affective ratings, and participants were told that the tasks would be easy, requiring limited effort. Participants were paid \$10 an hour. All participants were English-speaking and between 18 and 65 years of age, and had capacity to give consent. Participants with a diagnosis of schizophrenia or schizoaffective disorder were inpatients or outpatients from facilities associated with the Nathan S. Kline Institute (NKI), New York, or Bellevue Hospital, New York (study 3). Diagnosis of schizophrenia or schizoaffective disorder was assessed using the Structured Clinical Interview for DSM-IV (SCID) (First et al.,

1998) or the Diagnostic Interview for Genetic Studies (DIGS) (Nurnberger, Jr. et al., 1994). Non-patient participants had no Axis I psychiatric history and diagnosis as assessed with the Non-patient version of the SCID or the DIGS. They were community subjects who responded to advertisement and volunteered to participate in research. The studies were approved by the local Institutional Review Boards.

2.2. Study 1. Pleasure

The study task (adapted from Heerey and Gold, 2007) involved viewing sets of positive, negative and neutrally valenced IAPS photographs (Lang et al., 1999) on a computer screen. Participants were able to vary the viewing time for each set by key presses if they wished to. The task was fully explained and the participant completed two practice trials before being asked: "You are about to see various pictures on the screen, and you will be able to lengthen or shorten their viewing time. How much do you think you will enjoy this test?" After completion of the test, participants were asked: "How much did you enjoy this test?" The same 5-point Likert scale (1 = "not at all", 2 = "slightly", 3 = "moderately", 4 = "quite a bit", and 5 = "extremely") was used for these two questions and in studies 2 and 3.

2.3. Study 2. Interest

The study stimuli were 48 IAPS pictures shown on a computer and 48 sounds from the International Affective Digitized Sounds (Bradley and Lang, 1999). The task was designed to study affect reactivity and ambivalence (Trémeau et al., 2009). Items differ in valence (positive, negative or neutral). After each item presentation, participants were asked to rate how positive and negative they felt. The presentation order of the two subtests was randomized. Before each subtest, participants were asked: "you are going [to see pictures/hear sounds] that you may find pleasant or not, and you will be asked to rate how pleasant and how unpleasant they make you feel. How much do you think this test will interest you?" Immediately after each subtest, participants were asked again: "How interesting did you find this test?"

2.4. Study 3. Excitement

In this study of social perception (Antonius et al., 2013), participants were asked to rate neutral faces (Lundqvist et al., 1998) for ten different traits on a 1 to 5-point Likert scale (from "not at all" to "extremely"). The traits were tested sequentially: attractive, mean, trustworthy, intelligent, dominant, fun, sociable, aggressive, emotionally stable and weird. Before the tasks, participants were presented with the rating scale and asked: "In the following tasks, you will see faces, and you will be asked to rate how those faces appear to you, for example if they look happy or pretty. Of these choices in front of you, how excited are you about doing this task?" Immediately after completion of the tasks, the participants were asked: "Looking at the same five choices as before, overall, how exciting were the tests?"

2.5. Clinical ratings

Patients were clinically assessed with the following scales: 1) the Positive and Negative Syndrome Scale (PANSS) (Kay et al., 1987); 2) the modified Scale for the Assessment of Negative Symptoms (SANS) (Andreasen, 1989); 3) the Montgomery-Åsberg Depression Rating Scale (MADRS) (Montgomery and Åsberg, 1979) in study 2; 4) the Calgary Depression Scale for Schizophrenia (CDSS) (Addington et al., 1992) for studies 1 and 3; and 5) the Simpson and Angus scale (Simpson and Angus, 1970). All interviewers trained for calibration ratings and were blind to study performances. In addition, all study-2 participants completed the Revised Physical Anhedonia Scale (Chapman and Chapman, 1978), and the Revised Social Anhedonia Scale (Eckblad et al., 1982).

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