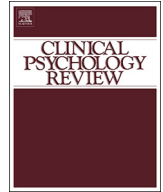




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## Clinical Psychology Review

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## Review

## Social motivation in schizophrenia: How research on basic reward processes informs and limits our understanding

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## HIGHLIGHTS

- Social impairment in schizophrenia arises from skill, cognition, and motivation deficits.
- Research on reward has improved understanding of general motivation.
- This work, however, lacks specificity for understanding social motivation.
- Insights emerge from research focused on social reward and punishment interactions.

## ARTICLE INFO

## Keywords:

Schizophrenia  
Social motivation  
Social functioning  
Reward

## ABSTRACT

Limited quantity and quality of interpersonal exchanges and relationships predict worse symptomatic and hospitalization outcomes and limit functional recovery in people with schizophrenia. While deficits in social skills and social cognition contribute to much of the impairment in social functioning in schizophrenia, our focus on the current review is social motivation—the drive to connect with others and form meaningful, lasting relationships. We pay particular attention to how recent research on reward informs, and limits, our understanding of the construct. Recent findings that parse out key components of human motivation, especially the temporal nature of reward and effort, are informative for understanding some aspects of social motivation. This approach, however, fails to fully integrate the critical influence of uncertainty and punishment (e.g., avoidance, threat) in social motivation. In the current review, we argue for the importance of experimental paradigms and real-time measurement to capture the *interaction* between social approach and avoidance in characterizing social affiliation in schizophrenia. We end with suggestions for how researchers might move the field forward by emphasizing the ecological validity of social motivation paradigms, including dynamic, momentary assessment of social reward and punishment using mobile technology and other innovative tools.

“Perhaps in no other domain of life is the simultaneous potential for rewards and threats so clear as it is for interpersonal relationships” (Gable & Prok, 2012, p. 352)

Social impairment in schizophrenia is pervasive and debilitating (Lipton, Cohen, Fischer, & Katz, 1981; Mueser, Bellack, Douglas, & Morrison, 1991). Impaired social functioning, including limited quantity (e.g., few number of friends, low frequency of contacts with family) and quality (e.g., low perceived benefit, diminished social skills) of interpersonal exchanges and relationships, is often the norm (Bellack, Morrison, Wixted, & Mueser, 1990; Corrigan & Phelan, 2004; Mueser &

Bellack, 1998). While recent work has shown that impaired social functioning is common across the developmental course of schizophrenia spectrum disorders (Barbaro & Dissanayake, 2007; Fulford et al., 2013; Fulford et al., 2013; Schlosser et al., 2015), we still know very little about what contributes to social impairment (Green et al., 2017). What we know from research in the general population, however, is that limited social engagement (i.e., social isolation), and especially the subjective experience of social isolation (i.e., loneliness), can have profound negative physical and psychological consequences (Cacioppo, Cacioppo, Capitanio, & Cole, 2015; Cacioppo, Hughes, Waite, Hawkley, & Thisted, 2006; Fett, Viechtbauer, Penn, van Os, &

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Krabbendam, 2011; Green et al., 2017). Recent studies underscore robust links between social engagement and loneliness with increased likelihood of mortality, putting social isolation on par with smoking as a leading cause of early death (Holt-Lunstad et al., 2015; Steptoe, Shankar, Demakakos, & Wardle, 2013).

In the current review, we will focus on social motivation as a key contributor to social functioning impairment in schizophrenia. We will make a case that the dynamic interplay between the experience of pleasure/reward and rejection/punishment in social interactions is key for our understanding of social motivation and related social functioning impairments. We will argue that it is time for the field to move beyond basic reward processing as a means of understanding what goes awry in social functioning—that the complexity of social motivation cannot be modeled with monetary rewards and losses and instead must involve real-life social exchanges that involve the dynamic interaction between rewards and punishments.

### 1. Current understanding of contributors to social functioning in schizophrenia

Three primary contributors to social functioning have been examined extensively in schizophrenia: social skills, social cognition, and social motivation<sup>1</sup> (see Table 1). Among these components, deficits in social skills and social cognition have been the most widely studied (Bellack et al., 1990; Couture et al., 2006; Fett, Viechtbauer, Penn, van Os, & Krabbendam, 2011; Green et al., 2017; Mueser & Bellack, 1998; Mueser et al., 1991).

Social skills include the observable behaviors occurring during social exchanges that support social competence, or the ability to achieve goals through social interaction (Bellack, Mueser, Gingerich, & Agresta, 2004). These skills are typically measured using standardized role-play scenarios, where observers code the quality and quantity of particular skills expressed. Social skills encompass a variety of behaviors, including reciprocity, problem solving, active listening, and appropriate eye contact and affective expression. Due at least in part to the broad neurobiological vulnerability of the disorder, individuals with schizophrenia experience deficits in social skills from an early age (Schiffman et al., 2004), and these deficits are relatively stable over time (Mueser, Bellack, Douglas, & Morrison, 1991). Importantly, social skill deficits contribute to lower subjective quality of life and well-being in schizophrenia (Salokangas, Honkonen, Stengård, & Koivisto, 2006).

Social cognition, as commonly studied in schizophrenia, includes abilities such as facial affect recognition, theory of mind, and emotion regulation. These abilities are believed to encompass the broad cognitive and emotional facets underlying social behavior. Given its multifaceted nature, social cognition is measured using a variety of instruments. While social cognition overlaps with more basic neurocognitive variables (e.g., working memory, processing speed), it is a separable construct that has been shown to mediate the relationship between general neurocognition and functional outcomes in schizophrenia (Green & Harvey, 2014). The surge in research on social cognition in schizophrenia has consistently documented a relationship to community functioning. For example, while neurocognition accounts for roughly 6% of the variance in community functioning, upwards of 16% may be explained by social cognitive abilities (Couture et al., 2006; Fett et al., 2011).

Despite the critical roles of social skills and social cognition in social functioning, there remains much to be explored in understanding contributors to successful forming and maintaining of interpersonal relationships in schizophrenia. For many years, researchers and

clinicians believed that diminished interest or pleasure in social relationships (i.e., social anhedonia) explained the majority of the social isolation witnessed in schizophrenia (Kwapil, 1998). This belief was largely driven by observations that people with schizophrenia appeared to be uninterested in social contact. Recent evidence, however, suggests that people with schizophrenia report a desire for social affiliation in standardized tasks (e.g., Blanchard, Park, Catalano, & Bennett, 2015) and in their daily life experiences (Gard et al., 2014), and they report improved social activity and inclusion as a top priority for treatment outcome (Shumway et al., 2003). Despite the clearly expressed need for connection, people with schizophrenia set fewer social goals in their daily lives (Gard et al., 2014), and consistently report being more alone and socially isolated than do people without schizophrenia (Andreasen, 1982; Grant, Addington, Addington, & Konner, 2001). Thus, rather than a general impairment in the experience of pleasure from relationships, there appear to be deficits in other social-affiliative behaviors that contribute to forming and maintaining social connections.

How can we reconcile the observation that people with schizophrenia often report a healthy desire to connect with others, yet show challenges in initiating and maintaining interpersonal relationships? One fruitful area to draw from is the burgeoning research in motivation and reward—in particular, recent translational research on objectively measured effort. Although this area of work has provided a new understanding of motivational impairment in schizophrenia, we still know relatively little about the mechanisms that drive deficits in social motivation, partly because motivation for social connection is inherently more complex than motivation for basic rewards (e.g., money, food), and thus more difficult to operationalize using self-report scales, or even laboratory tasks. The inherent uncertainty of social reward and punishment, for example, requires more cognitive and emotional resources than simply striving for consistently positive outcomes (as is measured in existing motivation/reward paradigms). Social interactions also have high potential for negative outcomes, such as criticism. In fact, the rewarding properties of social stimuli have the unique characteristic of potentially shifting to punishment (e.g., rejection) at any moment, which is quite distinct from the rewarding stimuli used in most basic reward studies (e.g., winning or losing money), where losing a rewarding stimulus is not the same thing as the experience of pain of criticism or rejection.

Given these complexities, the focus of this review will be on the current state of knowledge surrounding social motivation in schizophrenia, paying particular attention to how recent research on reward informs, and limits, our understanding of social motivation, or behaviors in the service of connecting with others. We will highlight recent findings that parse out key components of human motivation, especially the temporal nature of reward and effort. In reviewing this research, we emphasize how studies have not fully integrated the critical influence of uncertainty—i.e., the challenge in predicting whether an activity/task will result in reward (e.g., praise) or punishment (e.g., rejection)—a construct we believe is key to understanding motivation for social interaction in schizophrenia (see Fig. 1). We also emphasize that social motivation can be distinguished from social cognition and social skills on the basis of drive for social interaction, including observable exertion of effort needed to form and maintain social bonds. After covering the broader research on social motivation and application to schizophrenia, we argue for the critical importance of real-time measurement approaches that capture in-the-moment interactions between social approach and avoidance in order to best characterize social motivation and affiliation in schizophrenia. We end with suggestions for how researchers can move the field forward by emphasizing the ecological validity of social motivation paradigms, including dynamic assessment of social reward and punishment interactions.

<sup>1</sup> There are certainly other features that contribute to social functioning, including trait affiliation (Depue & Morrone-Strupinsky, 2005), extraversion (Cohen, Doyle, Skoner, Rabin, & Gwaltney, 1997), sociability (Cheek & Buss, 1981), and attachment (Bohlin, Hagekull, & Rydell, 2000). In the current review we focus on those facets most studied in the context of schizophrenia.

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