

## In Search of a Theoretical Structure for Understanding Motivation in Schizophrenia

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**This themed issue considers different ways to conceptualize the motivational impairment that is a core negative symptom of schizophrenia. Motivational impairment has been linked to poor functional outcome, thus it is important to understand the nature and causes of motivational impairment in order to develop better treatment strategies to enhance motivation and engage patients in the process of recovery. Motivation refers to the processes whereby goal-directed activities are instigated and sustained and can be thought of as the product of a complex interaction of physiological processes and social contextual variables. In this issue, the physiological processes of motivation are the focus of Barch and Dowd, who highlight the role of prefrontal and subcortical mesolimbic dopamine systems in incentive-based learning and the difficulties people with schizophrenia have using internal representations of relevant experiences and goals to drive the behavior that should allow them to obtain desired outcomes. The articles in this issue by Choi et al., Nakagami et al., and Silverstein, focus on social contextual or environmental variables that can shape behavior and motivation. Together, these articles highlight the impact of external cues and goal properties on the expectations and values attached to goal outcomes. Expectancy-value and Self-Determination theories provide an overarching framework to accommodate the perspectives and data provided in all these articles. In the following introduction we show how the articles in this themed issue both support the role of expectancies and value in motivation in schizophrenia and elucidate possible deficiencies in the way expectations and value get assigned.**

*Key words:* motivation/Expectancy-value theory/schizophrenia/Self-Determination theory

This themed issue considers different ways to conceptualize the motivational impairment that often characterizes schizophrenia. Because amotivation is recognized to be a major impediment to a positive functional out-

come in schizophrenia,<sup>1,2</sup> it is important to understand the nature and causes of the motivational impairment, to enable the development of better treatment strategies to enhance motivation, and to engage patients in the process of recovery.

Motivation literally means to be moved to do something and refers to the processes whereby goal-directed activities are instigated and sustained. Without motivation, a person is passive, apathetic, even inert, and unresponsive. In the psychotherapeutic context, motivation is associated with engagement in treatment, persistence of adaptive behaviors, attendance at sessions, willingness to do tasks, activity level, initiative, learning, treatment compliance, and extent of reliance on others.<sup>3,4</sup> In the context of learning situations, such as that occur at school, work, psychosocial skills training, and cognitive remediation, motivation is associated with greater learning and more persistence on learning tasks. People with schizophrenia often demonstrate decreased motivation to participate in treatment and in learning activities.<sup>5,6</sup> Even when they indicate that wellness and learning are valued goals, they may not demonstrate the behaviors that facilitate improvement. They may miss sessions or forget medications or assignments. Neurocognition is recognized as an important predictor of such functional behaviors, but several articles indicate that motivation mediates the relationship between cognition and functioning.<sup>7,8</sup> Increasingly, it is recognized that motivation processes need to be better understood if we are to meaningfully impact functional outcome in schizophrenia.<sup>9</sup>

A basic question when considering motivation in schizophrenia concerns the malleability of the motivational system. It is well recognized that schizophrenia is associated with a deficit in the amount of motivation, but there may also be aberrations in the capacity of the system to change and be responsive to environmental cues that trigger change in healthy controls. In this issue, Nakagami et al.<sup>10</sup> report that they measured motivation

to see if it changed over a 12-month time period. The results indicated that motivation is in fact dynamic over time; the amount of motivation changed, and this change was significantly associated with concurrent changes in psychosocial functioning that occurred during the process of treatment. Knowing that the motivational system in schizophrenia is dynamic, and thus malleable, opens a frontier of investigation. What are the determinants of change in motivation? What are the physiological processes and social contextual cues that cause motivation to increase and decrease?

### Determinants of Motivation

Motivation can be thought of as the product of a complex interaction of physiological processes and social contextual variables.

#### *Physiological Processes Underlying Motivation*

The physiological processes involved in motivation have relatively recently become a focus of investigation, and neuroscientists are beginning to understand how abnormalities in the dopamine system can lower drive- and goal-directed behaviors.<sup>11</sup> In this issue, the physiological processes underlying motivation are considered by Barch and Dowd<sup>12</sup> and also touched upon in the articles by Silverstein<sup>13</sup> and Nakagami et al.<sup>10</sup> In the article by Barch and Dowd,<sup>12</sup> motivation is operationalized as the process that translates appetitive or reward information into behavioral responses, where appetitive and reward information typically refers to measurable reward, although the significance of intangible reward (pleasure) is also recognized. Barch and Dowd<sup>12</sup> identify four major components of motivation and then review the physiological processes that have been linked to each component. The one component that appears largely intact in schizophrenia—hedonics or liking a received reward—seems to be mediated by activation of the opioid and gamma amino butyric acid-ergic systems in the nucleus accumbens shell and its projections to the ventral pallidum, as well as in the orbitofrontal cortex.<sup>14-17</sup> The other three components—wanting, assessing value, and goal-directed action—seem to be mediated by the mid-brain dopamine system, orbitofrontal cortex and anterior cingulate cortex, and dorsolateral prefrontal cortex, respectively. Silverstein<sup>13</sup> alludes to the possibility that there is a functional disconnectivity between dorsolateral prefrontal cortex and the subcortical mesolimbic dopamine system that accounts for the difficulty people with schizophrenia have in wanting and valuing what they like.

The article by Nakagami et al.<sup>10</sup> examines physiological processes underlying motivation by questioning if cognition is a rate-limiting factor for change in intrinsic motivation, which is the motivation to do something because it is inherently rewarding. Cognitive deficits are commonly thought to reflect disruption in the patho-

physiological processes involved in schizophrenia and as such could represent a physiologically based rate-limiting factor. However, Nakagami et al.,<sup>10</sup> in their longitudinal study of 130 outpatients with schizophrenia and schizoaffective disorder, found that baseline cognition did not predict change in intrinsic motivation over a 12-month period. Furthermore, change in neurocognition was not associated with change in intrinsic motivation. An important implication of these findings is that patients with both high and low baseline cognitive functioning are able to increase their intrinsic motivation, regardless of whether they improve their cognition. Another implication is that the physiological mechanisms that mediate the aspects of neurocognition they measured, do not appear to be a rate-limiting factor for change in intrinsic motivation.

Nakagami et al.<sup>10</sup> also found that higher levels of intrinsic motivation at baseline were predictive of higher rates of neurocognitive improvement over 12 months. These longitudinal data corroborate and elaborate the findings from several cross-sectional studies, which show that intrinsic motivation mediates the relationship between neurocognition and social role functioning. Perhaps, higher baseline levels of intrinsic motivation suggest that critical physiological systems are intact that then also form the basis for neurocognitive improvement. The findings discussed by Barch and Dowd<sup>12</sup> could implicate the dopaminergic system as the physiological mechanism underlying both higher levels of intrinsic motivation and neurocognitive improvement.

#### *Social Contextual Variables and Motivation*

Social context refers to environmental variables that can shape behavior and motivation, and these are the focus of several articles in this issue. The exact role of the social contextual variables in motivation has been and continues to be extensively studied in healthy controls, and there is lively debate about how factors in the environment affect intrinsic and extrinsic motivations. Extrinsic motivation is the motivation to do something because a tangible reward will occur (e.g. money), and intrinsic motivation is the motivation to do something because it is inherently rewarding (e.g. pleasure). In both cases, there is a reward, but the nature of the reward is different. The article by Silverstein<sup>13</sup> provides commentary on current thinking about the role of controlling vs autonomy-supportive environments in shaping motivation and behavior. Silverstein<sup>13</sup> makes the case that the delivery of tangible rewards in a supportive context has been associated with positive behavioral outcomes and therefore extrinsic motivation should not be neglected as an important determinant of behavior. Other articles in this and other issues<sup>10,18,19</sup> highlight the impact of social context on intrinsic motivation. Ultimately, physiological processes and social contextual variables intertwine to

**Table 1.** Two Theoretical Perspectives on the Determinants of Motivation

| Determinant                                    | Expectancy-Value Theory | Self-Determination Theory |
|--|-------------------------|---------------------------|
| Expectation of success/competence <sup>a</sup> | X                       | X                         |
| Value of activity <sup>a</sup>                 | X                       |                           |
| Goal orientation                               |                         |                           |
| Intrinsic <sup>b</sup>                         | X                       | X                         |
| Extrinsic <sup>a</sup>                         | X                       | X                         |
| Needs/drive <sup>a</sup>                       |                         | X                         |

<sup>a</sup>Research in schizophrenia has linked both physiological processes and social contextual variables to these determinants.

<sup>b</sup>Research in schizophrenia has linked social contextual variables to this determinant.

affect intrinsic motivation as well as the extrinsic motivational responses of an individual.

### Theoretical Perspectives

Theories of motivation often cite the role of expectancies, basic needs, cost, values, and goal orientation in the process that leads one to initiate and sustain behavior.<sup>20</sup> Wigfield and Eccles,<sup>20</sup> two leading researchers in the field of motivation, suggest that one could understand the motivation to engage in purposeful activity by asking three questions: Do I *expect* success at the task? Do I *value* the task? *Why* do I want to do the task? It is deceptively simple to consider that motivation could be answered by posing these three questions; in fact, research has articulated complex mechanisms that lead to expectations of success and that explain how and why people value one task over another and the nature of the goal orientation that determines why someone wants to do something. There are two theories—Expectancy-value theory and Self-Determination theory—that together provide a biosocial approach to answering these questions and explaining the individual and environmental factors that produce and shape motivation in schizophrenia. As illustrated in table 1, both theories appreciate that expectations of success and competence contribute to motivation. They both also include consideration of the intrinsic or extrinsic nature of goal orientation and how that can facilitate motivation and sustain behavior. Expectancy-value theory provides a unique focus on the value of an activity and the assessments of value and cost to the individual that influence motivation, whereas Self-Determination theory contributes a focus on the innate needs for autonomy, mastery, and social affiliation that can combine to initiate and sustain behavior in the absence of external reward. In the following sections, the utility of the Expectancy-value and Self-Determination conceptual frameworks for understanding motivation

in schizophrenia will be considered, taking into account the findings of the articles in this themed issue.

### *How Expectations of Success Impact Goal-Directed Behavior*

Expectations for success are largely related to perceptions of one's ability (self-efficacy) and perceptions of the difficulty of the task, which in turn are influenced by various internal and external variables.<sup>21</sup> For example, successful past performance may influence a positive expectation for future success, but a task with vague, distal, or unpredictable goal properties may lower expectations of reward (success). There is evidence that in schizophrenia, a pathophysiological process may negatively affect the ability to accurately assess expectations of success. Barch and Dowd<sup>12</sup> write that there is a growing body of work that suggests people with schizophrenia have reinforcement learning impairments on difficult tasks with varying probabilities of reinforcement, and impairment is evident in striatal activity in the brain during responses to cues that predict reward and to positive prediction errors. This literature is relevant to expectancy theory because it suggests that as the goal properties of tasks become more variable and unpredictable, people with schizophrenia have significantly more difficulty than healthy controls in accurately assessing expectations of success and reward attainment. Although not all studies apparently show these results, and the magnitude of impairment is influenced by level of negative symptom severity, Barch and Dowd<sup>12</sup> conclude that there is sufficient evidence to suggest an impairment in reward prediction mechanisms mediated by the striatum. This disruption of the process of accurately generating expectations of success (reward) would negatively influence drive-motivated behavior.

According to Expectancy-value theory, expectations of success will affect motivation to engage in goal-directed behavior. Expectations of success are linked to self-efficacy, a broad construct that is concerned with beliefs of personal capability or competency to do various activities. When people think they will be good at a particular task, they have self-competency, and they are more willing to persist at it and typically achieve at a higher level.<sup>22,23</sup> Those who anticipate being competent choose harder tasks and are more willing to try new tasks. They exert more effort because they think they will succeed.<sup>24</sup> There is considerable research demonstrating the role of perceived competency in healthy controls, and the article by Choi et al.<sup>18</sup> provides data showing that when people have schizophrenia, there is similarly a large role for perceived competency in learning outcomes. When their sample of 70 people with schizophrenia practiced cognitive skills for 10 sessions, baseline perceived competency as measured on a Perceived Competency Scale was the largest predictor of gains on independent tasks of cognition. Baseline expectations of success also predicted

greater persistence of learning on the task at 3-month follow-up, even after accounting for variance attributable to baseline cognitive ability, symptoms, and self-reports of task enjoyment. Compared with subjects with low self-competency for the learning exercise, subjects with high reports of self-competency were almost 4 times more likely to retain what was taught during the learning tasks even after 3 months. These findings support the notion that expectancy theory is an operative construct in schizophrenia.

Similar to the nonpsychiatric population, people with schizophrenia must believe that their actions can produce the outcomes they desire (self-competency) or else they may have little incentive or motivation to take on tasks. Understanding that people with schizophrenia must believe they will be successful if they are to become motivated is only a first step; we also need to consider if it is possible to change expectations of competency. The articles by Choi et al.<sup>5,18</sup> show that in schizophrenia, expectations of success can indeed change; expectancy is a dynamic process. In one study,<sup>5</sup> subjects were exposed to 2 different instructional conditions, and while the subjects in the motivationally enhancing learning condition increased perceived self-competency and then maintained those gains over a 3-month period, there was declining self-competency in the control condition. These findings underscore the importance of increasing our understanding of how to manipulate expectations of success in schizophrenia so that we create environments that promote—as opposed to deflate—self-efficacy and motivation.

The literature with healthy controls indicates that expectations of success are related to multiple variables, including perception of the difficulty of the task, past performance, role models, the persuasiveness of feedback on performance, physiological indicators, mind-set about performance capacity, and goal properties of the task.<sup>22,24–26</sup> In schizophrenia, we know that task difficulty and past performance are highly predictive of the expectation of future success. Basic and clinical laboratory studies have shown that learning occurring in the absence of errors is stronger and more durable than the traditional trial-and-error alternative, and repetitive successful practice of skills within the context of a rich schedule of positive reinforcement can promote expectations of performance success.<sup>27,28</sup>

Silverstein<sup>13</sup> reviews the literature on using the behavioral technique of shaping with tangible and nontangible rewards to allow for experiences of success in people with low self-competence at baseline. Another technique that may enhance perceived self-competency is the careful titration of the goal properties of the tasks.<sup>29</sup> This would be consistent with the work reviewed by Barch and Dowd<sup>12</sup>, which indicates that tasks that have variable and unpredictable goals may be perceived as too difficult, while tasks with proximal, clearly defined predictable goals

are likely to be seen as more manageable. For example, asking someone to walk 20 min a day has a more proximal and well-defined goal than asking someone to exercise more. People with limited working memory would have difficulty keeping multiple goal features in mind and therefore could easily disengage from the task because it is perceived as too challenging, and they anticipate failure at the task. According to expectancy theory, giving people tasks with goal properties that are appropriate to their cognitive capacity and that minimize the likelihood of failure should enhance motivation to do the task.

### *The Role of Task Value*

People are more likely to engage in activities if they perceive their value.<sup>20</sup> The value of an activity can come from the interest it generates or because it has perceived utility vis-a-vis reaching one's goals or because it helps one attain a future or desired self. Cost is another dimension that is applied to the assessment of the value of a task. Cost allows the weighing of the comparative merits of investing time and energy in different tasks and assumes a finite expenditure of energy and resources.

People who are unclear about their goals and the kind of person they want to be may be particularly drawn by the interest value of a task.<sup>29</sup> Interest value refers to how enjoyable the task is, and it is thus a highly personal attribution. When tasks lack interest value, and the patient cannot readily see the utility or attainment value, motivation may be jeopardized. On the other hand, if a person sees the utility of doing a task—ie, they can relate performance of the activity to their short- and long-range goals—then it may not be as necessary for the task to be (as) enjoyable and fun to perform. Then the gratification of doing the task comes from the perceived link between performance and goal attainment. One way to assist patients to appreciate the utility value of a task is to explicitly link performance on it to achievement of their goals. A basic premise of many recovery-based programs is that treatment is personalized to individual goals, and this fits with models of motivation that emphasize the role of utility value in facilitating initiation and maintenance of goal-directed behavior.

Attainment value differs from interest and utility value because the emphasis is on whether engaging in the activity can increase the likelihood of obtaining a desired future self or avoiding an undesired future self.<sup>20</sup> In vocational settings, the impact of attainment value is evident when someone says, “My father always had a steady job that paid benefits and I would like to be like him.” When skill-based recovery training is conducted in groups, attainment value can be an operative determinant of someone's motivation to participate and learn. Seeing a peer patient discuss goal procurement and attainment may motivate others to sustain productive behaviors.

Cost also informs the ultimate value of a task. Wigfield and Eccles<sup>20,26</sup> have highlighted the importance of considering this dimension that refers to the emotional and practical cost of choosing one activity over another. People who choose to partake in cognitive behavioral therapy may be limiting their access to another therapy or they may have to juggle family responsibilities or finances or they may have to consider their overall capacity to take on multiple commitments given the context of an illness that causes one to easily feel overwhelmed. When the costs of participating in any therapy are too high, patients may choose not to engage in that activity, even if they value the anticipated outcome of the therapy. On the other hand, not participating may have such a high cost that the patient is impelled toward participation.

There have been few articles that directly examined the role of task value in motivation of people with schizophrenia. In this issue, the topic is referenced by Silverstein,<sup>13</sup> who highlights the challenges of working with highly symptomatic patients who have low base rates of a desired behavior. He suggests that by using tangible rewards with this subset of patients, it may be possible to change the value attached to a behavior. Tokens, money, and other rewards may increase task value sufficiently to enhance performance of the desired behavior. Silverstein<sup>13</sup> further argues that if this activation of extrinsic motivation is done properly (ie, in an environment that promotes relatedness and self-competence), it may in turn be a first step in promoting the internalization of task goals that is sometimes necessary (as per Ryan and Deci<sup>30,31</sup>) for intrinsic motivation to occur. Similarly, Nakagami et al.<sup>10</sup> provide causal data that suggests that when both intrinsic motivation and daily functioning are low, initial functional improvement might be required to trigger increasing levels of intrinsic motivation. This elaborates Silverstein's<sup>13</sup> notions and suggests that extrinsic goal properties could be used to stimulate initial behavior change and better functioning and thereby trigger higher levels of intrinsic motivation.

Also in this issue, Choi et al.<sup>18</sup> address the role of task value in motivation to learn. In that study, reported utility value attributed to a learning task was measured in 70 outpatients with schizophrenia assigned to do cognitive training. Their baseline self-perceived competency at the learning task was the strongest predictor of subsequent cognitive performance, and perceptions of self-competency were positively related to task utility value at all 3 time points (baseline, posttesting, and follow-up). Strong correlations between perceptions of task utility value and self-competency at all assessment points provide clear evidence that a core component of Expectancy-value theory is operative in schizophrenia.

Barch and Dowd<sup>12</sup> write about the process of value computation as a necessary component of motivation and focus on two aspects of value assessment: the process of representing value information and the actual assess-

ment of cost or effort computation. They report that as of yet, there is little direct evidence for or against impairments in value or effort computation in schizophrenia, mechanisms putatively mediated by orbitofrontal cortex and anterior cingulate cortex, respectively. While schizophrenia is associated with impairments in orbitofrontal cortex and anterior cingulate cortex function, there are no studies that directly link orbitofrontal cortex or anterior cingulate cortex functions to the processes involved in assessing the value of experienced or anticipated rewards.

### *Why People Want to Do a Given Task*

According to virtually all motivation theories, people engage in tasks because they perceive them as rewarding, either because there will be a tangible result, eg, food, or because of intangible benefit, eg, pleasure or gratification of complex needs like social relatedness. It is generally recognized that extrinsic motivation and intrinsic motivation are both important determinants of behavior. For example, in a work setting, pay would be the extrinsic motivator and enjoyment of collegial relationships might be an intrinsic motivator. Less well recognized and understood is that while extrinsic and intrinsic motivation are both generally operative in complex behaviors, the balance may shift depending on the nature of the task and the person performing it. Furthermore, the same person performing the same task may have a different balance of motivations at different points in time. For example, a patient may initially attend a therapy group because they have been promised a certificate or cigarette and then later may attend the group because they like interacting with the other group members. The exact balance of extrinsic and intrinsic motivations can be a key factor in whether someone initiates and maintains a behavior. As Silverstein<sup>13</sup> points out in his article, extrinsic motivation can help a person with a low base rate of initiation, and as Choi et al.<sup>18,19</sup> point out, intrinsic motivation and perceived competency facilitate persistence in learning activities.

According to Self-Determination theory, the motivation to perform complex behaviors stems from the nontangible rewards experienced when basic human needs for mastery, autonomy, and relatedness are met.<sup>30,31</sup> In this model, individuals will be most motivated to engage in tasks if they believe they had choice and that they made the decision to do the task (autonomy), if they think they will be competent at the task (mastery), and value the accompanying social interactions.<sup>32</sup> Research with healthy controls indicates that when these needs are fulfilled, people will find a task inherently enjoyable and be motivated to continue participating in the activity, even if tangible benefits are minimal or absent.<sup>30,31</sup> This has important implications for working with people in therapeutic and learning settings, where tangible rewards are less salient than, eg, in a work setting. Both Nakagami

et al.<sup>10</sup> and Silverstein<sup>13</sup> write about the importance of creating therapeutic contexts where there is a collaborative-supportive, as opposed to controlling-hierarchical therapeutic relationship. Controlling interpersonal contexts are known to result in greater passivity and decreased persistence in the therapeutic activities in various medical populations, and there is evidence that this is also operative in schizophrenia.<sup>5</sup> Both Nakagami et al.<sup>10</sup> and Silverstein<sup>13</sup> discuss how supportive and collaborative goal setting can be key to not only accomplishing treatment goals but also supporting the emergence of intrinsic motivation. According to Self-Determination theory, when patients with psychosis are intrinsically motivated for a difficult treatment, they will engage in targeted behaviors because of the interest, enjoyment, and satisfaction derived from their engagement in the activity rather than exclusively due to external rewards such as monetary reinforcement or performance certificates. Research indicates that enhancing intrinsic motivation for treatment also increases the likelihood patients will both persist at and complete the tasks within a specified therapeutic time period rather than become disengaged and at risk for attrition and/or insufficient treatment intensity.<sup>5</sup> Consequently, intrinsically motivated behaviors are repeated without extensive external rewards or constraints and therefore more likely to be maintained within a treatment setting. This is especially relevant to developing treatments in schizophrenia because experiences of external reward and reinforcement are diminished in schizophrenia.<sup>33</sup>

While it is pragmatic and empirically prudent to focus efforts on targeting and increasing the innate value patients place on treatment rather than solely relying on platforms of external reward, enhancing intrinsic motivation should not mean that the value of extrinsic motivation is minimized. As Silverstein<sup>13</sup> points out in this issue, there is a large literature showing the beneficial results of harnessing extrinsic motivation to engage in productive behavior. Both extrinsic and intrinsic rewards have been successfully used with hospitalized patients who are the most symptomatic and cognitively compromised,<sup>34–36</sup> as well as with the more symptomatically stable outpatients. People with schizophrenia are a heterogeneous group, but we know that regardless of illness severity, they do have a capacity to respond to both extrinsic and intrinsic goal properties.

## Conclusion

This themed issue has examined various perspectives on the determinants of motivational deficits in schizophrenia. Research on the physiological bases for motivational deficits highlight the role of prefrontal and subcortical mesolimbic dopamine systems in incentive-based learning. Barch and Dowd<sup>12</sup> hypothesize that because of altered dopamine function in both subcortical and cortical

regions, individuals with schizophrenia have difficulties using internal representations of emotional experiences, previous rewards, and motivational goals to drive the current and future behavior that should allow them to obtain desired outcomes. Viewed from the perspective of Expectancy-value theory, physiological abnormalities interfere with the ability to accurately gauge expectations of success at meeting a goal and also interfere with the ability to assign value to the goal. Research on the social contextual variables that motivate people highlight the impact of external cues and goal properties on the expectations and values attached to goal outcomes. Choi et al.<sup>18</sup> demonstrate how expectation of success is a large predictor of learning outcomes, with the value assigned to the learning task significantly related to these expectations. Nakagami et al.<sup>10</sup> provide evidence that intrinsic motivation is dynamic over time and that change in intrinsic motivation was strongly associated with change in psychosocial functioning but not change in neurocognition. They hypothesize that the change in functioning altered expectations of success, which in turn increased motivation. Silverstein<sup>13</sup> discusses the impact of goal properties on motivation to do learning tasks and articulates the challenges of developing intervention strategies for a population that is not homogenous in the degree to which they have deficits in different motivational processes.

Expectancy-value and Self-Determination theories provide an overarching framework to accommodate these perspectives, and the data provided in these articles both support the role of expectancies and value in motivation in schizophrenia and elucidate possible deficiencies in the way expectations and value get assigned. When Expectancy-value and Self-Determination theories are integrated, they provide a biosocial approach to the individual and environmental factors that produce and shape motivation in schizophrenia. Both theories include consideration of how expectations of success and competence contribute to motivation. They both also include consideration of the intrinsic or extrinsic nature of goal orientation and how that can facilitate motivation and sustain behavior. Expectancy-value theory provides a unique focus on the value of an activity and the assessments of value and cost to the individual that influence motivation. Self-Determination theory contributes a focus on the innate needs for autonomy, mastery, and social affiliation that can combine to initiate and sustain behavior in the absence of external reward. Taken together, we argue that these theories provide a useful perspective on the dynamics of internal and external rewards and on the physiological and environmental factors that contribute to motivation in schizophrenia. They also provide a perspective on relevant treatment targets for interventions designed to improve motivation in schizophrenia.

Importantly, the articles in this themed issue indicate that people with schizophrenia have a malleable

motivational system, which responds to both extrinsic and intrinsic rewards. The adaptable nature of motivational processes in schizophrenia provides an exciting platform from which to design effective treatment programs to enhance functional outcome.

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