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Impact of Self-Determined Motivation on Work Behavior and Response to Cognitive Remediation in Individuals with Schizophrenia

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Impact of Self-Determined Motivation on Working Behavior and Response to Cognitive Remediation for Individuals with Schizophrenia

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Abstract

Research has implicated motivational deficits as having a severe impact on functional outcomes and quality of life for individuals with schizophrenia. There has been a call for investigation on how these motivational deficits impact different aspects of the therapeutic process for these individuals. A popular model of motivation used in recent investigation with schizophrenia has been Self-Determination Theory. This theory tries to describe why individuals undertake specific goals and behaviors, with the focus being the content of goal-directed outcomes and the regulatory processes with which outcomes are pursued. The goal of this investigation is to examine the impact of self-determined motivation on participation in a cognitive remediation intervention program for a group of individuals with schizophrenia.

Results suggest there was some stability for motivation throughout the program. Participants experienced an increase in intrinsic motivation and a decrease in both extrinsic and amotivation during their time in the program. Self-determined motivation had consistent significant positive relationships with aspects of better participant experience and work behavior. Relationships with treatment response were found to be inconsistent. There were significant differences between aspects of intrinsic and extrinsic motivation when it came to elements of participant experience, work behavior, and treatment response with self-determined motivation associated with better performance.

Keywords: Schizophrenia, Negative Symptoms, Motivation, Self-Determination The

Introduction

Negative symptoms within the diagnostic criteria for schizophrenia describe a loss of typical functioning (Kirkpatrick, Fenton, Carpenter, & Marder, 2006). Included under the umbrella of the definition of negative symptoms within the field of psychology today are blunted affect, poverty of speech, asociality, avolition, and anhedonia (Foussias & Remington, 2010). The symptoms of hallucinations and delusions may be more readily associated with the term schizophrenia in society today, but recent investigation has determined that these negative symptoms are core features of schizophrenia and can be just as debilitating as the experience of positive symptoms (Barch & Treadway, 2014; Kirkpatrick et al., 2006.)

History of Negative Symptoms

Discussion of these deficits has a long history. In Kraepelin's description of *dementia praecox* he observed a "weakening of mental processes resulting in deficits" (Jablensky, 2010). This definition allowed for better description of the experience individuals had with the disorder, as it allowed for an illustration which better captured what happened during the course of the disorder. Though description of negative symptoms predated the coining of the term "schizophrenia", the main focus of research began with positive symptoms. The psychopharmacological revolution within psychological treatment observed in the 1950s drove the focus into positive symptomology (Foussias & Remington, 2010). Antipsychotic medication allowed for abrupt alleviation of these symptoms which accompany schizophrenia, so it seems logical as to why they were the main focus for investigation. This trend within research continued for decades until the work of Carpenter (1988) and Crow (1980) shed light on the importance of negative symptoms.

Carpenter (1988) and associates were the first to scientifically confirm negative symptoms were a separate aspect of psychopathology with their own therapeutic implications. This allowed for negative symptoms to be viewed as a separate construct that needed further investigation. Crow (1980) concluded there were distinct types of schizophrenia based off the presentation of either positive or negative symptoms. *Type 1* was associated with the presence of mainly positive symptoms, while *Type 2* was associated with the presence of mainly negative symptoms. The typology view has been disregarded, and the field today has pushed to describe the experience of schizophrenia on a spectrum, but that does not mean negative symptoms are not seen as a separate aspect of the disorder.

A number of models have been used to investigate the structural validity of negative symptoms, and this research has confirmed negative symptoms repeatedly load on a factor separate of positive and disorganized symptoms (Blanchard & Cohen, 2006; Strauss et al., 2013). These investigations have also allowed for the revelation that negative symptoms themselves are multidimensional instead of unitary (Blanchard & Cohen, 2006; see also Strauss et al., 2013). This has aided in the creation of specific negative symptomology associated with deficits in functioning as well as assessment measures to help further describe the experience. Additional factor analysis has created two main clusters that encompass all symptoms within the concept. The first cluster is themed "*diminished expressivity*" and includes restricted affect and alogia, while the second cluster is themed "*motivational deficits*" and includes avolition, anhedonia, and asociality (Strauss, Waltz, & Gold, 2014).

Focusing investigation on negative symptoms has gained momentum in recent years. There is now compelling evidence regarding the clinical and theoretical importance of negative symptoms within the field of psychology today (Blanchard & Cohen, 2006). Much of this has

been driven by findings which have associated negative symptoms with poorer recovery, functional outcomes, and treatment response for individuals with schizophrenia (Horan, Kring, Gur, Reise, & Blanchard, 2011; Kirkpatrick et al., 2006; Strauss, Harrow, Grossman, & Rosen, 2010). There is a consensus within the field that negative symptoms are an area of therapeutic focus themselves (Kirkpatrick et al., 2006). Psychopharmacological interventions are commonly used to help alleviate the experience of hallucinations and delusion due to the biological basis of the symptoms. The impact of antipsychotic medication on positive symptomology has not seen any transfer into the area of negative symptomology. This observation has shed light on the idea that the two aspects of symptoms do not share the same underlying pharmacology (Kirkpatrick et al., 2006). This information has driven further investigation into the specific impact negative symptoms have on individuals with schizophrenia. Though it is important to investigate the full breadth of negative symptoms, recent research has theorized that the domain of motivational deficits has a bigger impact on areas of functional outcome, quality of life, and recovery than diminished expressivity (Strauss et al., 2014).

Motivational Deficits

Deficits in motivation and initiating goal-directed behavior are seen as core features of the experience of schizophrenia (Waltz & Gold, 2016). Research within this area has changed in recent years due to increased understanding of the processes driving the deficits. There was a belief within the field that motivational deficits were tied to ahedonic symptoms, which are best defined as limited capacity for experiencing pleasure. The explanation of why individuals with schizophrenia did not participate in goal-directed activities was because these activities were not found to be pleasurable in the moment and lowered initiation of any behavior tied to the activity. Research does back the notion that individuals with schizophrenia have a reduction of interests,

desires, goals, and purposeful or self-initiated acts (Fervaha, Foussias, Agid, & Remington, 2015; Foussias & Remington, 2008; Strauss & Gold, 2012). Recent investigation has revealed a more complicated process than just a limited capacity for experiencing pleasure. The consensus within the field now is that underlying disturbances in reward anticipation and learning, value representation, and effort-cost computation are driving deficits in motivation (Strauss et al., 2014).

Research on the prefrontal cortex and basil ganglia, two areas of the brain which are prominent with learning, have shed light on the cognitive impairments that influence the motivational deficits found in individuals with schizophrenia. Goal-directed behaviors are reliant on several elements, which include not only the hedonic experience or "*liking*" of reward, but also the anticipation of rewards, development and sustained representation of the reward, and guiding and planning behavior toward future reward (Schlosser et al., 2014). Investigation with individuals with schizophrenia has found a deficit in many of these basic elements. Strauss, Waltz, and Gold (2014) conducted a literature review that highlights these many deficits. First, individuals with schizophrenia show an impairment in anticipating rewards by having difficulty with predicting upcoming rewards. Studies have shown they have the ability when predictive cues are given, but without them, there is no activation within the area for predicting any upcoming rewards from behavior or the environment. Tied with this, individuals with schizophrenia display an impairment with generating, maintaining, and updating mental representations of value. Due to deficits in the prefrontal cortex, specially work behavior, the individual displays problems with creating an idea about what the value of a behavior or activity will be. Not only do they display troubles in creating a representation, but also once one is made, they have a difficult time keeping the current representation of value as well as changing it based

on new information. Another factor which plays into value representation is the deficit these individuals have in making rapid behavior changes in response to feedback. Further analysis shows these individuals are more likely to learn from negative feedback when compared to positive feedback. The individual will shape their behavior based on what they perceive as avoiding punishment rather than past experiences that have resulted in rewards. Finally, individuals with schizophrenia display some deficits in their decision making. It is believed this is driven by how the individual "explores their environment" as well as the computation of "effort versus cost" in behavior and activities. It is believed individuals are more likely to repeat actions than "explore" and try new ones that could net a better outcome. There is also research which has shown a deficit in the ability to correctly compute how much effort a behavior or activity will take versus the cost or outcome of said behavior or activity.

Reviewing the literature on goal directed behavior and the difficulties individuals with schizophrenia experience with its basic elements, it is easy to illustrate the motivational deficits experienced by these individuals. Initiating a behavior would be difficult if there were a disruption in the representation or anticipating of value of that behavior. There would be very little meaning behind the behavior itself. Also, there would not be a drive to change behavior more rapidly because the meaning behind the behavior is more likely to be based on avoiding punishment. This ??? could cause a stagnation in behavior and foster lower motivation. Further impact on motivation and initiation of goal-directed behavior could be observed when coupled with difficulties in decision making. Specifically, these motivational deficits would have a major influence on behavior that is tied to functioning for these individuals due to the disorder. It would cause disruption in working towards goals which are seen as pleasurable, productive

occupational work, engaging in therapy, and impairment in cognitive performance (Brach, 2005).

As highlighted previously, motivational deficits are theorized to have a greater impact on quality of life than any other negative symptom (Strauss et al., 2014). Research has confirmed motivational deficits are tied to worse community functioning, more dysfunction, and higher rates of comorbidity with anxiety and mood disorders (Fervaha et al., 2015; Schlosser et al., 2014; Tobe et al., 2016). Intrinsic motivation provides internal regulation of behavior based off an individual's likes and values, while amotivation is initiating a behavior without intent (Deci & Ryan, 2000b). Behavior has intent behind it and is regulated by either intrinsic or extrinsic motivation, depending on whether the regulation is coming internally or externally. In comparison, amotivation lacks any kind of regulation. Research has shown intrinsic motivation, tied to improved functioning, is reported less in individuals with schizophrenia while amotivation, tied to poorer functioning, is reported more. This higher level of amotivation has severe impacts for individuals with schizophrenia, as it has a direct impact on functional outcome, and specifically, that of role performance, household adjustment, and social functioning (Foussias & Remington, 2008).

There has been a call for more research within the area of motivational deficits to further illustrate the impact on individuals with schizophrenia (Strauss et al., 2014). There is a need for continued information on how concepts of motivation are related to specific areas of life including social, educational, and occupational functioning . Initially the belief within the field was motivation displayed a construct difficult to quantify and study and the results of any investigation would be too subjective to generalize the findings (Barch, 2008). Many reliable and

valid measures used to assess levels of motivation have been created in recent years, which address these former concerns.

The most important area is believed to be investigating how motivational deficits impact treatment. As psychopharmacology has become the preference for improving the experience of positive symptoms, there has been no carry over to negative symptoms ,and specifically, that of motivation (Tobe, 2016). Token economies have been used in the past research on cognitive tasks for individuals with schizophrenia, but the results indicate a problem with generalizability, as the monetary rewards did not improve overall cognitive functioning (Barch, 2008). This revelation suggests that intrinsic motivation may have more utility for treatment than extrinsic motivation. It is important to be able to translate models of motivation directly into studies of patients with schizophrenia (Strauss et al., 2014). Not only will this allow for some description of the impact motivational deficits will have on treatment interventions, but also point at specifc aspects of interventions which can be added or changed to combat these deficits. A model of motivation that has gained popularity recently when investigating these deficits for individuals with schizophrenia has been *Self-Determination Theory* (SDT) developed by Dr. Edward Deci and Dr. Richard Ryan (2000b).

Self-Determination Theory

Deci and Ryan (2000b) gave a complete overview of Self-Determination theory in their article titled, "*The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior*". Contemporary beliefs about motivation assume behaviors are initiated to the extent to which they will lead to desired outcomes and goals. It is the basic premise that an individual is more likely engage in and continue a behavior or activity because it will bring a desired outcome. The behavior has been reinforced by a positive experience. Where SDT begins to break

away from contemporary thoughts is the distinguishing of types of goals and outcomes and the impact on affective and behavioral consequences. The main questions which are trying to be answered about behavior through SDT are simply, “what?” and “why?”. SDT focuses on the content of goals to gain more information and understanding. Instead of believing two equally valued goals would have the same performance and affective response, SDT breaks down goals into content and the regulatory processes these outcomes are pursued. To address the why of behavior, SDT postulates that there are innate psychological needs which help integrate the content of goals and the regulatory processes. These needs act as the psychological driving force behind which regulatory process are chosen within a goal pursuit. Specifically, the needs of autonomy, competence, and relatedness are the three discussed in SDT. These needs are seen as the most important for ongoing psychological growth, integrity, and well-being. The most effective functioning and optimal development are associated with the satisfaction of these three basic needs from the environment. If any of these needs are not met, the consequence would be decreased functioning and development.

SDT shares some commonality with drive theories because of the discussion of satisfying needs, but there is one main difference between them. This difference is SDT focuses on psychological needs, while drive theories focus on physiological needs. Motivation within a drive theory is based off a physiological experience due to some reduction from a set point or homeostasis within a given need. The experience of thirst for an athlete is a good example. The athlete undertakes whatever physical activity is needed to play their given sport. This physical exertion causes the individual to experience some level of dehydration. The body then alerts the individual of this dehydration by causing them to feel thirsty. The individual then drinks water until they have satisfied this need of hydration back to their set-point and the feeling of thirst

goes away. Drive theory is based off of some reduction of a set-point for a need. SDT postulates the set-point for an individual is growth and believes humans are naturally inclined towards growth and activities that satisfy psychological needs (Deci & Ryan, 2000b). When specifically discussing the three main needs of autonomy, competency, and relatedness, SDT postulates it is adaptive for individuals to engage in interesting activities, excursive compacities, and pursue connectedness (Deci & Ryan, 2000b).

The main purpose of these psychological needs is to bring meaning to the process of intrinsic motivation. Deci and Ryan (2000b) postulate individuals are naturally inclined to optimal development and growth and actively engage in their environment to do so. Intrinsic motivation is seen as the optimal psychological growth function. Intrinsically motivated behaviors are associated with the most effective functioning. Intrinsically motivated activities are defined as, "those that individuals find interesting and would do in the absence of operationally separable consequences" (Deci & Ryan, 2000b). Research has shown the needs of autonomy, competence, and relatedness provide the most sufficient definition of intrinsic motivation. The need of autonomy illustrates an individual being able to undertake activities naturally based off of inner values and interests. This is where the term, "self-determined" is derived from. Autonomy describes behavior that is determined solely off of the self and inner interest, and intrinsically motivated behaviors are viewed as the prototype of autonomous activities. The need of competence describes the individual having not only the feeling of self-determination behind a behavior, but also having the skills needed to undertake the behavior. Research has shown feedback following a task enhances intrinsic motivation compared to no feedback at all (as cited in Deci & Ryan, 2000b). The feedback taps into the need of competence and allows the individual information to illustrate their competencies within a certain activity. Finally, the need

of relatedness describes the aspect of social cohesion within the building of the self. Research has shown intrinsic motivation is associated with social cohesion. A simple way to think about this relationship is through attachment theory and with intrinsic motivation being more likely to develop in the context of secure attachment which fosters relatedness. If there is the underlying sense of security, individuals will feel autonomous and competent with their behavior.

Deci and Ryan (2000b) state that depending on if these three needs are satisfied or if any one or more are not fulfilled, the individual will create one of three causality orientations which will guide and regulate goal-directed behavior. These are the regulatory processes that were discussed earlier. SDT illustrates this process of regulating behavior with the use of a spectrum with one end being self-determined behavior and the opposite end being non-self-determined behavior. The first causality orientation is "*Autonomous*" and falls under the umbrella of self-determined. This orientation is essentially intrinsic motivation as it regulates behavior on interest and self-endorsed values. Along with the aspect of intrinsic motivation, well integrated extrinsic regulation is found within this orientation. This is essentially the idea that if an individual can identify the importance of external rewards, which come as part of a behavior, and then integrate with aspects of the self, this can mimic intrinsic motivation. A good example of this is exercise. Becoming physically fit through the means of frequent physical exercise has many external rewards such as health and body aesthetic benefits. Integration of these rewards would be the individual understanding the importance of working out to their overall health and well-being and making that an aspect of their self-concept. Therefore, being a healthy person is in their self-concept, so the external rewards are no longer driving the behavior and they are engaging in physical activity based solely off of internal values. This Autonomous orientation is created through the satisfaction of all three psychological needs. It's assumed this is the case because

Autonomous orientation is essentially intrinsic motivation. Also, because of this association and satisfaction of the three needs, this orientation is viewed as providing the most effective functioning and promotion of growth and well-being.

The second causality orientation discussed by Deci and Ryan (2000b) is the "*Controlled*" orientation. This orientation is essentially extrinsic motivation, as behavior is regulated by external pressures and how it is perceived that one should behave. The Controlled orientation is found within the middle of the spectrum for SDT. There is the possibility that this orientation is regulated by the same external factors as Autonomous, but integration of importance of the regulator is missing. These regulators do not become part of an individual's self-concept, so they are still seen as external pressure instead of internal values. The needs of competence and relatedness are satisfied, but the need for autonomy is not fulfilled. The individual can still receive information about their competencies and have a sense of social cohesion, but their goal-directed behaviors are being regulated by outside pressures instead of internal values and beliefs. It is likely the individual may be more likely to regulate their behavior based on avoiding punishment instead of gaining rewards, which would have direct consequence for goal-directed behavior due to lack of internal drive.

The third and final orientation discussed by Deci and Ryan (2000b) is the "*Amotivation*" orientation. This orientation may also be described as the "*Impersonally*" orientation. The basic definition of this orientation is not behaving intentionally and having focus on ineffective indicators within the environment. This orientation is found on the opposite end of Autonomous and is essentially seen as non-self-determined behavior. Using the Autonomous and Controlled orientation as comparison, behavior from the Amotivation orientation has no regulation from either internal values and interests or external pressures. Whether goal-direct behavior is

regulated internally or externally, there is intention within doing the behavior itself. There may be some intrinsic value, or it may allow the person to avoid punishment and this provides meaning behind the behavior. Behavior regulated by the Amotivation orientation lacks this meaning for the individual. There is no intention undertaking a behavior, because there is a lack of any regulation either internally or externally. All three of the psychological needs are not met. The individual is not regulating goal-directed behavior based off of self-determination, is not competent in the skills needed to undertake the behavior, and is not connected to the larger social structure surrounding them. The individual would just be doing the behavior without fully understanding the behavior and the reason why they are doing it. There would be no drive either internally or externally due to lack of reward. A good example would be a student pursuing good grades. A student who falls within the Autonomous orientation would pursue good grades because they enjoy school and good performance in school is part of their self-concept. A student who falls within the Controlled orientation would pursue good grades due to gaining allowance from their parents or they may feel some social pressure from their peers to do so. A student who falls within the Amotivation orientation would have no regulation behind pursuing good grades and this specific goal-directed behavior would lack intention and likely be stopped.

Past Investigation of SDT within Schizophrenia

The research which has been done within the area of schizophrenia and SDT has focused on satisfaction of the three psychological needs, understanding the nature of the causality orientation within the population, and their impact on goal creation and functional outcomes. Breitborde, Kleinlein, and Srihari (2012) provide information on the satisfaction of the three psychological needs for individuals with first-episode psychosis. The investigation compared the report of a group of individuals diagnosed with first episode psychosis to a group of same aged

healthy controls to understand the nature of need satisfaction. The investigation demonstrated that the group with first-episode psychosis reported significantly less satisfaction of all three psychological needs than healthy controls. Barch, Treadway, and Schoen (2014) investigated the nature of the causality orientation for individuals with schizophrenia and the association of these orientations to community and work functioning. They found that individuals with schizophrenia were significantly more likely to be in the Amotivation orientation compared to healthy controls and the Amotivation orientation was correlated with poorer functioning in both community and work roles. Tobe et al. (2016) also investigated the nature of the causality orientation for individuals with schizophrenia, focusing on the association with social functioning. They found that Autonomous orientation was significantly lower for individuals with schizophrenia and this orientation was the strongest predictor of social functioning. Gard et al. (2014) examined the construction of goals for individuals with schizophrenia through the lens of SDT and how the needs and causality orientation impacted these goals. They discovered individuals with schizophrenia were less motivated to fulfill the needs of autonomy and competency when compared to healthy controls. An interesting finding was for the need of relatedness; there was no difference between individuals with schizophrenia and healthy controls. The investigation also concluded individuals with schizophrenia were significantly more likely to have goals based in disconnection and disengagement, which has association with the Amotivation orientation.

Current Investigation

As highlighted, there has been a call for further investigation within the area of motivational deficits for individuals with schizophrenia in order to understand the full impact of these deficits across various factors. SDT has gained popularity within investigation, as it adds thorough definition and meaning to the motivation process that drives goal-directed behavior. It

was believed motivation was too large of a construct to measure and examine, but SDT gives an opportunity to break down goal-directed behavior into the simple aspects of what and why. Much of the investigation that has been conducted has been on the nature of the needs and causality orientations and how they impact overall functioning for individuals with schizophrenia. As discussed, it is also important to explore models of motivation in relation to treatment response. This focus will provide important insight into how motivational deficits impact the process of treatment. The main goal of this investigation is to examine how motivation orientations as defined by self-determination theory impact the therapeutic process for individuals with schizophrenia. The study design is a secondary data analysis using an archival data set from a cognitive remediation efficacy clinical trial. This archival data set includes self-report measures of motivation and participant experience, as well as, an objective measure of work performance. These constructs were assessed at multiple points throughout the program. This data will allow for an analysis that not only covers behavior gains made due to an intervention, but also many other important facets that accompany treatment response. The first aim of this investigation is to evaluate motivational levels and sustainability of motivation during the cognitive remediation program in patients with schizophrenia. The main areas of interest within this aim are understanding if participants are motivated for cognitive remediation training, what type of orientation, and how motivation changes over the course of the program. The second aim is to examine relationships between motivational orientations and participant experience, observed work performance, and change in cognitive performance. This will provide information on the influence of motivation that may be had within the areas of personal experience, work behavior, and treatment gains. The final aim is to examine how individuals differ in the aspects of participant experience, observed work performance and change in

cognitive performance based off of differences in the motivational orientations. The goals are to understand the exact nature of the relationships between the motivational orientations and the identified outcomes and to determine if there are significant differences in outcomes associated with type and level of motivational orientation.

Method

Archival Data Procedure

The archival data set used for this investigation comes from a randomized, double-blind, active placebo-controlled, parallel groups clinical trial of a 48-session cognitive remediation program. Focus of this clinical trial was to examine the efficacy of using cognitive remediation as an intervention for working memory deficits for a group of individuals with schizophrenia. The program included three 60-minute sessions weekly at the Minneapolis Veterans Affairs Health Care System (VAHCS). Participants were paid for their attendance. Participants were randomly assigned to either the treatment condition of cognitive remediation or the active-placebo control condition, a computer skills class. This analysis will focus on the data from the participants who finished the active-treatment condition. This will allow for illustration of the impact of motivation for the cognitive remediation intervention itself and not the placebo control condition.

The cognitive remediation program that was chosen included the word n-back task. The n-back task is a computer program that acts as a training tool and measures working memory ability. Participants decide whether a stimulus in a sequence is the same or different from one that appeared "*n*" items ago (Kane, Conway, Miura, & Coleflesh, 2007). The participants within this study had words as the stimulus for the task. They were presented with a word for a few

seconds, the screen would go blank, and then another word would appear on the screen. The task was to decide if this new word matched the previous word that was shown on the computer screen. This process continues, and the participant evaluates each new word that appears. This would be an example of "*1-back,*" as the evaluation only consisted of the initial two words, comparing the current word with one word back. As the participant does better, the word for comparison keeps moving back further. "*2-back*" would have the participant compare the current word with the word that appeared two previous. "*3-back*" would be three and the process continues. The program does not advance the participant to a new stage until they get enough correct answers in the current stage they are in. If they move up and answer too many questions wrong, the participant is moved back down.

There were many measures that were completed during the program. Self-report measures of motivation were assessed at baseline and post cognitive remediation training, while subjective experience and objective work behavior were assessed at 3, 9, and 16 weeks during the program. These measures will be fully explained shortly.

Participants

Table 1 displays the results of the participant characteristics. Sixty-six participants (51 Male, 15 Female) with schizophrenia between the ages of 24-60 (M = 46.08, SD = 9.45) completed the active-treatment condition. As explained earlier, only participants who completed the active-treatment condition were included in this analysis. Participants were recruited by the Minneapolis VAHCS from the surrounding Twin Cities area. All participants met diagnostic criteria for schizophrenia according to the DSM-IV and clinical symptoms of schizophrenia were confirmed using the expanded Brief Psychiatric Rating Scale (BPRS), the Scale for the Assessment of Negative Symptoms (SANS), and the Scale for the Assessment of Positive

Symptoms (SAPS). The average age of disorder onset was 25.83 (SD = 8.01) while the average duration of disorder in years was 20.27 (SD = 11.32). The majority of the sample was White (70%) followed by a small percent being African American (27%) and American Indian (3%).

Materials

Self-Determined Motivation. Self-Determined Motivation was measured using the Treatment Self-Regulation Questionnaire (TSRQ). The self-report questionnaire measures why individuals do or would do a healthy behavior (Williams, Deci, & Ryan, 1999) such as entering treatment and following the program, changing unhealthy behavior, and other health-relevant behaviors (Williams et al., 1999). The TSRQ is based in SDT as it allows for the assessment of the degree which an individual's healthy behavior is self-determined. Participants answer questions on a 7-point scale (1 = *Not True at All*; 7 = *Very True*) and these rating are broken down into subscales for the three regulatory orientations of Autonomous, Controlled, and Amotivation. The TSRQ allows for the creation of a 4th regulatory style of "Relative Autonomous" which measures the amount of Autonomous motivation present in comparison to Controlled motivation (Williams et al., 1999). The Relative Autonomous orientation is illustrating only intrinsic motivation while controlling for any integration of controlled regulators within the self that could cross over from the Controlled orientation. The questions and length of the questionnaire were modified to fit with the cognitive remediation treatment, which is commonly done with the TSRQ. There are many elements of healthy behavior that could be assessed with the measure and there is room to modify it to meet the specific demands of the behavior in question. Participants completed the 19-item questionnaire both at baseline and post cognitive remediation. Internal consistency across location and behaviors with Cronbach's Alpha

being found to be at least .73 for each orientation as well as validity has been supported though invariance analysis (Levesque et al., 2007).

The averages for each motivational orientation were calculated to fall within the 7-point scale used by participants. This was in large part due to the disparities in the number of questions for each orientation. Both Autonomous and Controlled motivation had six questions for participants to answer while Amotivation had only three. It was deemed appropriate to find the average rating a participant would give for each motivational orientation for use in the analysis.

Participant Experience. Participant Experience was measured using the Intrinsic Motivation Inventory (IMI). This 37-item self-report inventory assesses the participants' subjective experience for the target activity within an investigation (Deci & Ryan, 2000a). Participants use a 7-point scale (1 = *Not True at All*; 7 = *Very True)* to answer questions regarding their experience with the activity being used within the specific investigation. Assessment of the IMI was taken at 3, 9, and 16 weeks during the program. These answers allow for ratings of six different domains of personal experience, but this analysis will only focus on the domains of interest and enjoyment, perceived competence, effort and importance, and value. Interest and Enjoyment is the variable that most directly assesses intrinsic motivation for the participant (Deci & Ryan, 2000). The variables of perceived competence, effort and importance, and value all give information regarding the participants' beliefs of their skills for the program as well as their overall opinion of how useful the program will be. These variables allow for the analysis of aspects being focused on within this study, because they best represent the experience with the cognitive remediation program itself. Domains or pressure and choice describe the impact of extraneous variables outside of the intervention program, and thus, were excluded from this analysis. The IMI has been found to be a valid and reliable measure for use within

cognitive tasks with good internal consistency (.92) and test-retest reliability (.77; Deci & Ryan, 2000). Just like the TSRQ, the averages of the variables of the IMI were calculated to fall within the 7-point scale due to disparities between the number of questions used to assess each variable.

Work Behavior. The Work Behavior Inventory (WBI) assesses objective participant work behavior. This 36-item standardized assessment was designed specifically to measure work performance for individuals with severe mental illness. The inventory covers 5 sub-scales, but this analysis will only include *Work Habits*, *Work Quality, Global,* and *Total Ratings*. Again, the narrowing of the domains is to focus on those that best represent the experience with the cognitive remediation program itself. These domains will best allow for an illustration of the participants' work behavior in the cognitive remediation program. The domains of social skills, cooperativeness, and personal presentation are seen as variables that represent social aspects of the participants' behavior that are not as necessary for completing cognitive remediation. The use of the Total Rating variable will allow for some analysis of the variables that were not of focus. Research team members present for the cognitive remediation sessions rated performance of the participants on a 5-point scale (1 = *Consistently Inferior and/or Inconsistent Performance*; 5 = *Consistently Superior and/or Consistent Performance*). Each of the variables had seven questions giving a possible total of 35. The variable, Global Rating, was just one question at the end of the assessment that was evaluated using the 5-point scale. The Total Rating was simply the addition of all of the questions together with the possible score being 175. Lab members took assessments of work behavior at three, nine, and sixteen weeks during the program. Inter-rater reliability and internal-consistency have been found to fall within the good to excellent range (Bryson, Bell, Lysaker, & Zito, 1997).

Treatment Response. Treatment response for this analysis was assessed using performance from the word n-back task and the MATRICS Consensuses Cognitive Battery (MCCB). The N-back score for participants was recorded after each cognitive training session. D-prime is a measure of sensitivity that reflects accuracy of performance. D-prime scores were transformed to place performance on different versions of the N-back task on the same scale. The transformed D-prime scores from Weeks 2 and 3 were averaged together to represent baseline while the D-prime scores for Weeks 15 and 16 were averaged to represent the completion. This was seen as a way to control for individuals underperforming in the first and last weeks due to first experience with the task and possible diminished effort with the completion of the program. A program change variable was created by subtracting the average of weeks two and three from the average of the last two weeks to represent how much change happened within the program.

The MCCB is a cognitive assessment that measures an individual's overall cognitive functioning. It includes subscales that measure not only working memory, but also attention and vigilance, speed of processing, verbal language, visual learning, problem solving, and social cognition. The MCCB was administered at both baseline and post cognitive remediation training. A change variable was made subtracting a composite overall score (age and gender corrected T-score) at baseline from the post cognitive remediation score. Having both performance on the cognitive remediation task and overall cognitive functioning allows for a more in-depth analysis of the impact of self-determined motivation for participants within the clinical trial.

Results

Aim 1: Type, Level, Sustainability of Motivation

Table 2 displays the averages for the motivational orientations at baseline and post cognitive remediation. Overall, participants were intrinsically motivated for the cognitive remediation program. Autonomous motivation was reported as having the highest average at baseline (M = 5.69, SD = 1.17) followed by Controlled (M = 3.33, SD = 1.38), Amotivation (M = 2.69, SD = 1.29), and finally Relative Autonomous (M = 2.37, SD = 1.28). This trend somewhat continued into post cognitive remediation as participants reported the highest average for Autonomous motivation (M = 5.75, SD = 1.17) followed by Controlled (M = 3.12 .69, SD = 1.27), but reported higher Relative Autonomous (M = 2.63, SD = 1.32) than Amotivation (M = 2.52, SD = 1.25).

All of the motivational orientations displayed significantly positive relationships from baseline to post cognitive remediation to suggest some level of sustainability. Table 3 provides the results of the correlational analysis between the motivational orientations. Reports of autonomous motivation (r = .71, p < .001) strongly related from baseline to post cognitive remediation while Relative Autonomous (r = .53, p < .001), Controlled (r = .50, p < .001), and Amotivation (r = .47, p < .001) were all moderately related.

There was change experienced within the motivational orientations between baseline to post cognitive remediation and this was highlighted by conducting the paired sample t-tests found in Table 2. There was a significant difference for Amotivation from baseline to post cognitive, t(65) = 30.01, p < .001, as participants reported an average decrease of .14 (SD = 1.27) within the orientation. A trend was found for Relative Autonomous, t(63) = -1.95, p = .056, with participants reporting an average increase of .22 (SD = 1.29). There was also a reported increase within Autonomous (M = .12, SD = .94), but this difference was not found to be

significant, , $t(65) = 1.18$, $p = .24$. Participants reported a decrease within Controlled motivation ($M = -.11$, $SD = .1.33$), but this difference was also not found to significant, $t(65) = .67$, $p = .88$.

Aim 2: Relationships with Motivation Orientations

Motivation & Participant Experience. Table 4 and Table 5 display the results for the correlational analysis between the motivation orientations and participant experience. Baseline Autonomous motivation displayed the strongest and most consistent significantly positive relationship with the variables of focus for participant experience. There was a moderate positive relationship found for each variable with the largest relationships found with perceived value ($r = .65$, $p < .001$) followed by effort and importance ($r = .63$, $p < .001$) and interest and enjoyment ($r = .50$, $p < .001$) and a weak positive relationship with perceived competence ($r = .32$, $p = .01$). The consistent significantly positive relationship continued between Autonomous Motivation and the participant experience variables post cognitive remediation. Again, there was a moderate positive relationship found between perceive value ($r = .65$, $p < .001$) and interest and enjoyment ($r = .50$, $p < .001$) while effort and importance ($r = .47$, $p < .001$) and perceived competence ($r = .42$, $p = .01$) displayed a weak positive relationship with Autonomous Motivation.

Baseline Relative Autonomous motivation also displayed a consistent significantly positive relationship with the personal experience variables. There was a moderate positive relationship with perceived value ($r = .30$, $p = .01$) and a very weak relationship with interest and enjoyment ($r = .28$, $p = .022$) and effort and importance ($r = .27$, $p = .01$). The relationships increased in strength after finishing the program. Reported Relative Autonomous motivation after cognitive remediation displayed a moderate positive relationship with perceived value ($r = .44$, $p < .001$), effort and importance ($r = .37$, $p = .003$), and interest and enjoyment ($r = .31$, $p = .015$).

Baseline Controlled motivation displayed a somewhat significantly positive relationship with the variables of personal experience. There was a significant moderate positive relationship with both perceived value (r = .30, *p* = .016) and effort and importance (r = .30, *p* = .07). The significant relationships with Controlled motivation and the variables of personal experience were not sustained post-cognitive remediation.

The only motivation orientation to display significantly negative relationships with the variables of personal experience was Amotivation. Participants' reports of Amotivation at baseline displayed a weak negative relationship with interest and enjoyment (r = -.27, *p* = .03) and perceived value (r = .25, *p* = .04). Post cognitive remediation, Amotivation displayed significant moderate negative relationships with intertest and enjoyment (r = -.37, *p* = .003) and perceived competence (r = -.36, *p* = .004). A trend was found for a weak negative relationship with perceived competence (r = .-.24, *p* = .054).

Motivation and Work Behavior. Table 6 and Table 7 displays the results for the correlational analysis between the motivation orientations and work behavior. The relationship between the motivational orientations at baseline and work behavior were found to be less consistent when compared to participant experience. Amotivation proved to have the most consistent relationship with the variables of work behavior. Participants' reports of Amotivation at baseline displayed a significantly moderate negative relationship with Work Quality (r = .-39, *p* = .001), Total Rating (r = -.39, *p* = .001), Global Rating (r = -.380, *p* = .002), and Work Habits (r = -.35, *p* = .001). The only significant relationship found between participants' reports of Controlled motivation at baseline and work behavior was a weak negative relationship with Work Quality (r = -.26, *p* = .037). The only significant positive relationship found for any of the

motivational orientations and work behavior was a weak relationship between Relative Autonomous and Total Rating (r = .28, p = .02).

Relationships between the motivational orientations and work behavior became more consistent at post cognitive remediation. The trend of Amotivation being the most consistent with work behavior continued with the completion of the program. Participant reports of Amotivation post cognitive remediation displayed significant moderate negative relationships with Total Rating (r = -.42, p < .001), Work Habits (r = -.35, p = .004), Global Rating (r = -.32, p = .008), and Work Quality (r = -.32, p = .009). Controlled motivation post cognitive remediation continued the trend of significant negative relationships with work behavior by displaying weak negative relationships with Total Rating (r = -.29, p = .049), Work Quality (r = -.29, p = .02), and Global Rating (r = -.32, p = .04).

In comparison to the negative relationships, post cognitive remediation Relative Autonomous motivation displayed the strongest and most consistent significantly positive relationships with work behavior. There were significant moderate positive relationships found between Relative Autonomous post cognitive remediation and Total Rating(r = .41, p = .001), Work Habits (r = .40, p = .001), Global Rating (r = .39, p = .002), and Work Quality (r = .30, p = .018). Participant reports of Autonomous motivation post cognitive remediation also displayed significant positive relationships with work behavior, but only a weak relationship with Total Rating (r = .26, p = .038).

Motivation and Treatment Response. Table 8 and Table 9 displays the results for the correlational analysis between the motivation orientations and treatment response. Relationships between the motivation orientations and treatment response variables were found to be the most inconsistent. None of the motivation orientations at baseline had any type of significant

relationship with either N-back performance change or MCCB change. As for post cognitive remediation, Controlled motivation had the only significant relationship with N-back change by displaying a weak negative relationship (r = -.27, p = .028) and Relative Autonomous motivation had the only significant relationship with MCCB change by displaying a weak positive relationship (r = .25, p = .037).

Aim 3: Differences between High and Low Motivation Groups

The way that was chosen to analyze differences due to motivation orientations was to split the participants into dichotomous groups of high and low for each orientation based off of their post cognitive remediation ratings. It was deemed appropriate for a score of "6" and above as high for Autonomous and Controlled motivation and any score "5.5" and above for Relative Autonomous and Amotivation. A one-way ANOVA was conducted to analyze the differences found with the variables of participant experience, work behavior, and treatment response. Effect sizes for the analyses are reported in the corresponding tables.

Autonomous. Table 10 displays the results of the one-way ANOVA for high and low-Autonomous motivation. Analysis indicated that the most significant differences between high and low-Autonomous motivation were found in the variables of participant experience. There was a significant difference between the groups found for average ratings of participant interest and enjoyment, $F(1, 64) = 10.552$, p = .002. High-Autonomous motivation (M = 6.13, SD = .98) had significantly higher self-report ratings of average interest and enjoyment compared to low-Autonomous motivation (M = 5.34, SD = .96). There was also a significant difference between the groups for participant reports of effort and importance, $F(1, 64) = 10.981$, p = .002, as again the high-Autonomous motivation (M = 5.57 , SD = .65) group had significant higher average self-reports reports of effort and importance when compared to low-Autonomous motivation (M

= 5.04, *SD* = .60). The analysis indicated there was another significant difference found between the groups for ratings of perceived competence, $F(1, 64) = 13.429$, $p = .001$, with the trend of the high-Autonomous motivation (*M* = 5.03, *SD* = .79) having a higher average rating than low-Autonomous motivation (*M* = 4.59, *SD* = .75) continued for self-reported perceived competence. Finally, there was a significant difference found between the groups for the last variable of participant experience of perceived value $F(1, 64) = 18.74$, $p < .001$. High-Autonomous motivation (*M* = 6.22, *SD* = 1.02) again had a significantly higher overall self-reported average for perceived value when compared to low-Autonomous motivation (*M* = 5.12, *SD* = 1.02).

The results for work behavior found that there was only one variable with significant differences between groups of high and low-Autonomous Motivation. Results for Total Rating displayed a significant difference between the groups for Autonomous motivation groups, $F(1, 64) = 6.135$, $p = .016$, with the high-Autonomous motivation (*M* = 154.83, *SD* = 16.70) having significantly better scores for total work behavior rating compared to the low-Autonomous motivation group (*M* = 144.42, *SD* = 17.27).

The analysis indicated there were no significant differences between groups of high and low-Autonomous motivation for the variables of treatment response.

Controlled. Table 11 displays the results of the one-way ANOVA for high and low-Controlled motivation. Analysis indicated the most significant differences found between high and low-Controlled motivation were found between the variables of work behavior. Results illustrated there was a significant difference between the groups for Work Habits , $F(1, 64) = 6.973$, $p = .010$, with low-Controlled motivation group (*M* = 30.08, *SD* = 4.06) having better observed Work Habits compared to the high-Controlled motivation group (*M* = 26.72, *SD* = 3.58). There was also a significant difference found within Work Quality for the groups, $F(1, 64)$

= 6.973, p = .010, as the low-Controlled motivation group (M = 29.64, SD = 5.13) had better observed Work Quality compared to the high-Controlled motivation group (M = 24.86, SD = 4.80). Another significant difference found between the groups for total rating, $F(1, 64) = 6.973$, p = .010, with low-Controlled motivation (M = 153.18, SD = 16.97) again having a better overall Total Rating when compared to high-Controlled motivation (M = 137.10, SD = 14.60). Finally, there was a significant difference found between the groups for Global Rating , $F(1, 64) = 7.051$, p = .01. Results again displayed the low-Controlled motivation group (M = 4.18, SD = .66) had a better overall Global Rating than the high-Controlled motivation group (M = 3.63, SD = .63).

Analysis with treatment response indicated there was one variable that had a significant difference between the groups. There was a significant difference in week change for the cognitive remediation task between the high and low-Controlled motivation groups, $F(1, 64) = 7.870$, p = .007. The low-Controlled motivation group (M = .55, SD = .65) had a larger change in their performance on the cognitive remediation task compared to the high-Controlled motivation group (M = -.03, SD = .67).

For participant experience, the analysis indicated the least amount of significant differences for Controlled motivation, as no significant differences were found for the variables between the high and low groups.

Relative Autonomous. Table 12 displays the results of the one-way ANOVA for high and low-Relative Autonomous motivation. Analysis indicated that the Relative Autonomous motivation had a similar trend when it came to differences between high and low groups. The most significant differences for the groups within Relative Autonomous motivation were found in participant experience. There was a significant difference found between the Relative Autonomous groups for participant experience, $F(1, 64) = 7.875$, p = .007 with results indicating

the high-Relative Autonomous group (M = 6.56, SD = 1.22) had a significantly higher average self-report of interest and enjoyment when compared to low-Relative Autonomous motivation (M = 5.67, SD = 1.22). There was also significant difference found for the Relative Autonomous groups for self-reported perceived competence, $F(1, 64) = 7.349$, $p = .009$, as the high-Relative Autonomous motivation group (M = 5.60, SD = 1.02) had a higher average self-report of perceived competence compared to the low-Relative Autonomous group (M = 4.87, SD = .76). Another significant difference was found between the groups of self-reported effort and importance, $F(1, 64) = 7.023$, $p = .01$. Again, the high-Relative Autonomous group (M = 5.81, SD = .45) had a significantly higher average self-report of effort and importance compared to the low-Relative Autonomous group (M = 5.24, SD = .68). Finally, there was a significant difference found between the groups for the last participant experience variable of self-reported perceived value, $F(1, 64) = 11.56$, $p = .001$. The assumption of homogeneity between the groups was not met for analysis of perceived value indicated by a *Levene's Test of Homogeneity of Variance*, $F(1, 64) = 4.107$, $p = .003$. A *Welch's adjusted F* was used due to not meeting the assumption of homogeneity and the test found there was a significant difference between the groups, , $F(1, 5.371) = 7.132$, $p = .041$. Results illustrated the high-Relative Autonomous group (M = 6.74, SD = .40) again had a significantly higher average self-report of perceived value compared to the low-Relative Autonomous group (M = 5.54, SD = 1.15).

There was a trend found for both variables of treatment response for high and low-Relative Autonomous motivation groups. The high-Relative Autonomous group (M = .74, SD = .61) had a larger change with the cognitive remediation task than the low-Relative Autonomous group (M = .39, SD = .69), $F(1, 64) = 2.54$, $p = .074$. Also, the high-Relative Autonomous group

(M = 4.21, SD = .69) had a larger change with the MCCB than the low-Relative Autonomous group (M = 3.91, SD = .67), $F(1, 64) = 1.53$, $p = .069$.

There were no aspects of work behavior that were found to have significant differences between high and low-Relative Autonomous groups.

Amotivation. Table 13 displays the results of the one-way ANOVA for high and low-Amotivation motivation. The analysis indicated that Amotivation had the least significant differences found within any variables of focus as there were no significant differences found for any aspect of personal experience, work behavior, and treatment response.

Discussion

The main goal of this analysis was to evaluate a motivational model within the confines of an intervention program for individuals with schizophrenia. Specifically, it was of interest to investigate the impact of self-determined motivation for participants with schizophrenia undertaking a cognitive remediation intervention program.

Aim 1: Type, Level, Sustainability of Motivation

The first aim of this investigation was to understand the how motivated individuals were to undertake the program through the different types of SDT motivational orientations and the level of sustainability for the duration of the program. Results indicated there was self-determined motivation to participate in the cognitive remediation program, as participants reported a relatively high level of Autonomous motivation. Relationships between baseline and post-cognitive remediation suggested there was a level of sustainability found within the motivational orientations, but the results of the analysis indicated there was some significant change found for certain motivational orientations. Participants did report a significant decrease

in Amotivation, while a trend was found for an increase within Relative Autonomous motivation. There was also a non-significant increase in Autonomous motivation and decrease in Controlled motivation. Results suggest participants became more intrinsically motivated while becoming less extrinsically motivated and amotivated with their time in the program.

The significant change in Amotivation from baseline to post cognitive remediation is an important aspect of the investigation. This suggests elements of the program may satisfy the innate needs underlying SDT that are not being met for participants in their environment. Deci and Ryan (2000b) illustrated amotivation was behavior that not only lacked intention, but also lacked the satisfaction of the three underlying intrinsic needs of self-determined behavior of autonomy, competence, and relatedness. The trend of an increase within Relative Autonomous motivation may suggest the program helped satisfy the need of autonomy, which is the only need not found within Controlled motivation. Further analysis is needed to be able to pinpoint if the satisfaction of autonomy is driving the difference between baseline and post cognitive remediation reports of Amotivation. It would also be useful to examine if the change is due to just being a part of the intervention program or specifically because it was a cognitive remediation program. This analysis would provide an element of treatment utility to discern what specifically about the program is causing the change.

Aim 2: Relationships with Motivation Orientations

The second aim was to examine the relationships between the motivational orientations and aspects of self-reported participant experience, work behavior, and treatment response. Autonomous motivation had a consistent positive relationship with the intrinsic motivation aspect of participant experience. This relationship was expected as self-determined motivation is defined as the experience of intrinsic motivation. Amotivation had a consistently negative

relationship with the intrinsic aspects of participant experience in question. Again, this relationship is expected due to the nature of Amotivation not having any of the three innate needs for self-determined motivation satisfied. For observed working behavior, the consistent positive and relationship was found for Relative Autonomous while Amotivation and Controlled motivation had consistently negative relationships. The finding fits with current research that elements of extrinsic motivation may undermine intrinsic motivation, and thus, have a relationship with impaired functioning. As for treatment response, relationship with the motivational orientations were found to be inconsistent compared to the other aspects of focus. There was only the significantly negative relationship with Controlled motivation for cognitive remediation week change and the significantly positive relationship with Relative Autonomous motivation found for MCCB change.

There results suggest that levels of Amotivation and Controlled Motivation may need to be assessed before undertaking an intervention program to help improve engagement and outcomes. The consistent negative relationship with participant experiences points to the inverse relationship that Amotivation has with intrinsic motivation. High levels of Amotivation may influence self-reports of participant experience with intervention programs and impact the performance for the individual in the program. Controlled motivation was not only found to have negative relationships with observed work behavior, but also with treatment response for the cognitive remediation program. As highlighted, research has illustrated extrinsic motivation having relationships with poorer functioning and outcomes. The results also suggest that using Relative Autonomous motivation with working behavior may have more utility than Autonomous Motivation due to having more meaningful relationships. Measuring the amount of

intrinsic motivation relative to the amount of extrinsic motivation a participant has may give more information on the individual's potential performance.

Aim 3: Differences between High and Low Motivation Groups

The final aim was to examine the difference within personal experience, work behavior, and treatment response due to high and low levels of the motivational orientations. Consistent with the correlational data, there were significant differences found for participant personal experience within Autonomous and Relative Autonomous motivation. High levels of each were associated with significantly higher scores for the variables for participant experience when compared to low motivation. This is an expected outcome as these two motivational orientations discuss intrinsic motivation. There were significant differences found in observed work behavior for Controlled motivation. Low levels of Controlled motivation had significantly better scores on the observed work behavior variables than high levels. Interestingly, there were significant differences found in week change for cognitive remediation as high levels of Relative Autonomous motivation and low levels of Controlled motivation experienced significantly better performance within the cognitive remediation program from start to finish.

These results solidify the conclusions made from the correlational data. Aspects of intrinsic and extrinsic motivation within individuals should be assessed before undertaking an intervention program. Not only were there significant relationships found, but there were significant differences for work behavior and treatment response found for high and low levels of intrinsic and extrinsic motivation. This also adds a stronger point to the idea of Relative Autonomous motivation having more utility than Autonomous motivation alone. More investigation is needed, but Relative Autonomous motivation provided more meaningful information about participants within this study than Autonomous motivation. This may be due

to the presence of integrated external regulators found within Autonomous motivation that are controlled for within Relative Autonomous motivation.

Amotivation had no significant difference found and this may be due in large part to the criteria used to split high and low groups. There was an extremely unequal distribution of the participants into high and low groups as only one participant fell into the high group using the chosen criteria. The scale within the TSRQ was used to help split the groups from high to low and it was deemed appropriate to set the criteria to 5.5 for Amotivation. If a participant scored a question of Amotivation any lower than a 5.5, it was deemed that they were not expressing high Amotivation with that answer. Correlational data suggests there may have been a significant decrease in scores with high Amotivation compared to low, but further analysis with a larger sample will be needed to investigate.

Limitations

There were some limitations within this current investigation. Groups for the analysis of high and low motivational orientations were split by an arbitrary split guided by the scale within the TSRQ. Only one participant fell within the high Amotivation group which caused issues when trying to calculate significant difference. There is also the issue of if the number used to split the groups is an accurate representation of high motivation. Further analysis should you some time of normative data as a comparison Another limitation is the possible influence of other variables to the results of the study. This analysis focused on motivation and there were participants that could have possible held high motivation in a certain orientation, but experienced difficulties within cognitive remediation due to their level of functional impairment. The differences that were seen could be merely due to the level of functioning for specific individuals instead of motivational levels. Participants were also paid for their attendance at the

program. This could have added exaggerated external regulation experienced by the individual and had some influence on their self-reported motivational levels. There were also aspects of measuring the variables of focus that could impact the internal validity of the study. The TSRQ and IMI were self-report measures filled out by the participants, while the WBI was an overserved measure filled out by a research team member. There may be some threats to internal validity present due to bias from the participants and members of the research team. Though main focus of the archival study was to examine the efficacy of the cognitive remediation program, participants may have answered filled out assessment related to motivation and participant experience as they feel they should have. Members of the research team could had problems with consistency or added undue bias when filling out the assessment of work behavior. There is the added factor that the WBI was only assessed three times during the program and it may be hard to measure many weeks of behavior in one setting. Also, one participant that completed cognitive remediation did not attend the last session and therefore there was no Week 16 data to use for this participant. The week change variable for this individual was assessed by combining Weeks 14 and 15 with Weeks 2 and 3. This may have influenced week change in some way that could have impacted internal validity of analysis ran with variable. The small sample size of participants brings in problems with generalizability of the results. The significant aspects of this study may only describe the sample that was used and not the population as a whole. Finally, effect size was not addressed within the analysis of the study. Though significant relationships and differences were found, there may only be a small effect size seen driving these results.

Conclusion

Motivational deficits for individuals with schizophrenia have been of recent focus within investigation for the population. This study provides an insightful analysis to examine how these motivation deficits impact a specific treatment intervention. Self-determined motivation was found to have significant relationships and differences found with better performance variables within the intervention. Controlled motivation and Amotivation were associated with poorer functioning for participants within the program. The analysis illustrates the importance of continued examination into the influence of self-determined motivation for individuals with schizophrenia. Further analysis should address the elements of Amotivation and Controlled motivation within the therapeutic process. This will allow for more information about the functional impact of the motivational processes and potential areas to add to interventions to combat their influence. There should be continued analysis into how self-determined motivation can be fostered within individuals with schizophrenia.

References

Barch, D. M. (2008). Emotion, motivation, and reward processing in schizophrenia spectrum disorders: What we know and where we need to go. *Schizophrenia Bulletin, 34*(5), 816-818. doi:http://dx.doi.org.ezproxy.mnsu.edu/10.1093/schbul/sbn092

Barch, D. M., Treadway, M. T., & Schoen, N. (2014). Effort, anhedonia, and function in schizophrenia: Reduced effort allocation predicts amotivation and functional impairment. *Journal of Abnormal Psychology, 123*(2), 387-397. doi:http://dx.doi.org.ezproxy.mnsu.edu/10.1037/a0036299

Blanchard, J. J., & Cohen, A. S. (2006). The structure of negative symptoms within schizophrenia: Implications for assessment. *Schizophrenia Bulletin, 32*(2), 238-245. doi:http://dx.doi.org.ezproxy.mnsu.edu/10.1093/schbul/sbj013

Breitborde, N. J., Kleinlein, P., & Srihari, V. H. (2012). Self-determination and first-episode psychosis: Associations with symptomatology, social and vocational functioning, and quality of life. *Schizophrenia Research*, *137*(1-3), 132-136. https://doi.org/10.1016/j.schres.2012.02.026

Bryson, G., Bell, M. D., Lysaker, P., & Zito, W. (1997). The work behavior inventory: A scale for the assessment of work behavior for people with severe mental illness. *Psychiatric Rehabilitation Journal, 20*(4), 47-55. Retrieved from http://ezproxy.mnsu.edu/login?url=https://search-proquest-com.ezproxy.mnsu.edu/docview/619098926?accountid=1225

Carpenter, W. T., Heinrichs, D. W., & Wagman, A. M. (1988). Deficit and nondeficit forms of schizophrenia: The concept. *The American Journal of Psychiatry, 145*(5), 578-583. doi:http://dx.doi.org.ezproxy.mnsu.edu/10.1176/ajp.145.5.578

Crow T. J. (1980). Molecular pathology of schizophrenia: more than one disease process?. *British medical journal*, *280*(6207), 66–68. doi:10.1136/bmj.280.6207.66

Deci, E. L., & Ryan, R. M. (2000). *Intrinsic Motivation Inventory* [Measurement instrument]

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227-268. doi:http://dx.doi.org.ezproxy.mnsu.edu/10.1207/S15327965PLI1104_01

Fervaha, G., Foussias, G., Agid, O., & Remington, G. (2015). Motivational deficits in early schizophrenia: Prevalent, persistent, and key determinants of functional outcome. *Schizophrenia Research, 166*(1-3), 9-16. doi:http://dx.doi.org.ezproxy.mnsu.edu/10.1016/j.schres.2015.04.040

Foussias, G., & Remington, G. (2010). Negative symptoms in schizophrenia: avolition and Occam's razor. *Schizophrenia bulletin*, *36*(2), 359–369. doi:10.1093/schbul/sbn094

Jablensky A. (2010). The diagnostic concept of schizophrenia: its history, evolution, and future prospects. *Dialogues in clinical neuroscience*, *12*(3), 271–287.

Kane, M. J., Conway, A. R. A., Miura, T. K., & Colflesh, G. J. H. (2007). Working memory, attention control, and the n-back task: A question of construct validity. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 33*(3), 615-622. doi:http://dx.doi.org.ezproxy.mnsu.edu/10.1037/0278-7393.33.3.615

Kirkpatrick, B., Fenton, W. S., Carpenter, W. T., Jr, & Marder, S. R. (2006). The NIMH-MATRICS consensus statement on negative symptoms. *Schizophrenia bulletin*, *32*(2), 214–219. doi:10.1093/schbul/sbj053

Levesque, C. S., Williams, G. C., Elliot, D., Pickering, M. A., Bodenhamer, B., & Finley, P. J. (2007). Validating the theoretical structure of the treatment self-regulation questionnaire (TRSQ) across three different health behaviors. *Health Education Research, 22*(5), 691-702. doi:http://dx.doi.org.ezproxy.mnsu.edu/10.1093/her/cyl148

Gard, D. E., Sanchez, A. H., Starr, J., Cooper, S., Fisher, M., Rowlands, A., & Vinogradov, S. (2014). Using self-determination theory to understand motivation deficits in schizophrenia: The 'why' of motivated behavior.*Schizophrenia Research, 156*(2-3), 217-222. doi:http://dx.doi.org.ezproxy.mnsu.edu/10.1016/j.schres.2014.04.027

Horan, W. P., Kring, A. M., Gur, R. E., Reise, S. P., & Blanchard, J. J. (2011). Development and psychometric validation of the clinical assessment interview for negative symptoms (CAINS). *Schizophrenia Research, 132*(2-3), 140-145. doi:http://dx.doi.org.ezproxy.mnsu.edu/10.1016/j.schres.2011.06.030

Schlosser, D. A., Fisher, M., Gard, D., Fulford, D., Loewy, R. L., & Vinogradov, S. (2014). Motivational deficits in individuals at-risk for psychosis and across the course of schizophrenia. *Schizophrenia Research, 158*(1-3), 52-57. doi:http://dx.doi.org.ezproxy.mnsu.edu/10.1016/j.schres.2014.06.024

Strauss, G. P., & Gold, J. M. (2012). A new perspective on anhedonia in schizophrenia. *The American Journal of Psychiatry, 169*(4), 364-373. doi:http://dx.doi.org.ezproxy.mnsu.edu/10.1176/appi.ajp.2011.11030447

Strauss, G. P., Harrow, M., Grossman, L. S., & Rosen, C. (2010). Periods of recovery in deficit syndrome schizophrenia: A 20-year multi–follow-up longitudinal study.*Schizophrenia Bulletin, 36*(4), 788-799. doi:http://dx.doi.org.ezproxy.mnsu.edu/10.1093/schbul/sbn167

Strauss, G. P., Horan, W. P., Kirkpatrick, B., Fischer, B. A., Keller, W. R., Miski, P., . . . Carpenter, W. T., Jr. (2013). Deconstructing negative symptoms of schizophrenia: Avolition–apathy and diminished expression clusters predict clinical presentation and functional outcome. *Journal of Psychiatric Research, 47*(6), 783-790. doi:http://dx.doi.org.ezproxy.mnsu.edu/10.1016/j.jpsychires.2013.01.015

Strauss, G. P., Waltz, J. A., & Gold, J. M. (2014). A review of reward processing and motivational impairment in schizophrenia. *Schizophrenia bulletin*, *40 Suppl 2*(Suppl 2), S107–S116. doi:10.1093/schbul/sbt197

Tobe, M., Nemoto, T., Tsujino, N., Yamaguchi, T., Katagiri, N., Fujii, C., & Mizuno, M. (2016). Characteristics of motivation and their impacts on the functional outcomes in patients with schizophrenia. *Comprehensive Psychiatry, 65*, 103-109. doi:http://dx.doi.org.ezproxy.mnsu.edu/10.1016/j.comppsych.2015.10.006

Waltz, J. A., & Gold, J. M. (2016). Motivational Deficits in Schizophrenia and the Representation of Expected Value. *Current topics in behavioral neurosciences*, *27*, 375–410. doi:10.1007/7854_2015_385

Williams, G. C., Deci, E. L., & Ryan, R. M. (1999). Treatment Self-Regulation Questionnaire Packet

Tables

Table 1

Participant Characteristics

Measure	*M*	*SD*
Age	46.08	9.45
Sex (M:F)	51:15	
Years of Education	13.20	1.74
WTAR Raw Score	36.18	9.00
Predicated IQ	103.15	9.87
Age of Illness Onset	25.83	8.08
Duration of Illness	20.27	11.32
Psychiatric Hospitalizations	6.98	5.67
BPRS Overall	41.15	11.55
SANS Overall	1.62	.95
Ethnicity (%)		
- White	46 (70%)	
- African American	18 (27%)	
- American Indian	2 (3%)	

Table 2

TSRQ Baseline and Post Cognitive Remediation Averages

Motivation Orientations	Baseline *M* (SD)	Post *M*(SD)	*t*(65)	Sig	Cohen's D
Autonomous	5.69 (1.19)	5.81 (1.15)	1.18	.241	.10
Controlled	3.24 (1.39)	3.13 (1.29)	.666	.508	-.08
Relative Autonomous	2.46 (1.31)	2.68 (1.34)	14.15	.000	.17
Amotivation	2.64 (1.20)	2.50 (1.27)	30.01	.000	-.11

Table 3

TSRQ Baseline and Post Cognitive Remediation Correlations

	TSRQ Post			
TSRQ Baseline	1	2	3	4
Autonomous (1)	.71**	-	-	-
Control (2)	-	.50**	-	-
Amotivation (3)	-	-	.47**	-
Relative Autonomous (4)	-	-	-	.53**

*Note: ** p <. 001, * p* < .05

Table 4

Baseline TSRQ and IMI Average Correlations

	IMI Average			
TSRQ Baseline	Interest/ Enjoyment	Competence	Effort/ Importance	Value
Autonomous	.50**	.32*	.63**	.65**
Control	-.19	.09	.30*	.30*
Amotivation	-.27*	-.14	-.17	-.25*
Relative Autonomous	.28*	.22	.27*	.30*

*Note: ** p <. 001, * p* < .05

Table 5

Post Cognitive Remediation TSRQ and IMI Average Correlations

	IMI Average			
TSRQ Post	Interest/ Enjoyment	Competence	Effort/ Importance	Value
Autonomous	.50**	.42*	.47**	.65**
Control	.03	.03	.01	.07
Amotivation	-.37*	-.24	-.21	-.36*
Relative Autonomous	.31*	.24	.37*	.44*

*Note: ** p <. 001, * p* < .05

Table 6

Baseline TSRQ and WBI Average Correlations

	WBI Average			
TSRQ Baseline	Work Quality	Work Habits	Total Rating	Global Rating
Autonomous	-.04	.03	.12	.04
Control	-.26*	-.20	-.18	-.14
Amotivation	-.39*	-.35*	-.39*	-.38*
Relative Autonomous	.20	.23	.28*	.17

*Note: ** p <. 001, * p* < .05

Table 7

Post Cognitive Remediation TSRQ and WBI Average Correlations

	WBI Average			
TSRQ Post	Work Quality	Work Habits	Total Rating	Total Rating
Autonomous	.10	.24	.26*	.26*
Control	-.29*	-.22	-.24*	-.24*
Amotivation	-.32*	-.34*	-.42*	-.42*
Relative Autonomous	.30*	.40*	.41*	.41*

*Note: ** p <. 001, * p* < .05

Table 8

Baseline TSRQ and Treatment Response Correlations

	Treatment Response	
TSRQ Baseline	Week Change	MATRICS Change
Autonomous	.01	.02
Controlled	-.19	-.12
Relative Autonomous	.08	.19
Amotivation	-.17	-.10

*Note: ** p <. 001, * p* < .05

Table 9

Post Cognitive Remediation TSRQ and Treatment Response Correlations

	Treatment Response	
TSRQ Post	Week Change	MATRICS Change
Autonomous	.01	.04
Controlled	-.27*	-.15
Relative Autonomous	.09	.25*
Amotivation	-.21	-.11

*Note: ** p <. 001, * p* < .05

Table 10

One-Way ANOVA of Work Behavior, Participant Experience, and Treatment Response by High and Low-Autonomous Motivation

Measures	High *M*(SD)	Low *M*(SD)	F(1,64)	Sig	Cohen's D
Work Behavior					
- Work Habits	30.18 (4.23)	28.56 (3.97)	2.51	.118	.39
- Work Quality	29.45 (5.26)	27.90 (5.47)	1.37	.246	.29
- Total Rating	154.83 (16.70)	144.42 (17.27)	6.14	.016*	.61
- Global Rating	4.21 (.69)	3.91 (.67)	1.53	.069	.31
Personal Experience					
- Interest/Enjoyment	6.13 (.98)	5.34 (.96)	10.55	.002*	.81
- Competence	5.03 (.79)	4.59 (.75)	13.43	.001*	.56
- Effort/Importance	5.57 (.65)	5.05 (.60)	10.98	.002*	.83
- Value	6.22 (1.02)	5.12 (1.02)	18.74	<.001**	1.08
Treatment Response					
- Week Change	.49 (.80)	.41 (.59)	.20	.660	.11
- MCCB Change	4.21 (.69)	3.91 (.67)	1.53	.069	.44

*Note: ** $p <. 001$, * $p < .05$*

Table 11

One-Way ANOVA of Work Behavior, Participant Experience, and Treatment Response by High and Low-Controlled Motivation

Measures	High *M*(SD)	Low *M*(SD)	F(1,64)	Sig	Cohen's D
Work Behavior					
- Work Habits	26.72 (3.58)	30.08 (4.06)	6.97	.010*	-.92
- Work Quality	24.86 (4.80)	29.64 (5.13)	8.69	.004*	-.98
- Total Rating	137.08 (14.60)	153.18 (16.97)	9.24	.003*	-1.07
- Global Rating	3.63 (.62)	4.18 (.66)	7.05	.010*	-.84
Personal Experience					
- Interest/Enjoyment	5.98 (.87)	5.75 (1.08)	.45	.503	.25
- Competence	5.09 (.72)	4.98 (.87)	.19	.666	.15
- Effort/Importance	5.48 (.41)	5.31 (.72)	.65	.423	.36
- Value	6.06 (.71)	5.75 (1.15)	1.10	.298	.39
Treatment Response					
- Week Change	-.03 (.67)	.55 (.65)	7.87	.007*	-.87
- MCCB Change	.42 (4.80)	2.24 (5.51)	1.14	.290	-.37

*Note: ** $p <$ .001, * $p <$ .05*

Table 12

One-Way ANOVA of Work Behavior, Participant Experience, and Treatment Response by High and Low-Relative Autonomous Motivation

Measures	High *M*(SD)	Low *M*(SD)	F(1,64)	Sig	Cohen's D
Work Behavior					
- Work Habits	32.45 (1.66)	28.87 (4.26)	3.22	.078	.90
- Work Quality	32.43 (2.54)	28.04 (5.50)	2.27	.137	.85
- Total Rating	163.45 (16.70)	147.62 (17.97)	1.74	.192	.89
- Global Rating	4.58 (.32)	3.98 (.69)	.12	.728	.93
Personal Experience					
- Interest/Enjoyment	6.56 (.98)	5.63 (.96)	10.55	.002*	.97
- Competence	5.03 (.79)	4.59 (.75)	13.43	.001*	.58
- Effort/Importance	5.57 (.65)	5.05 (.60)	10.98	.002*	.86
- Value	6.22 (1.02)	5.12 (1.02)	18.74	<.001**	1.08
Treatment Response					
- Week Change	.74 (.61)	.39 (.69)	2.45	.074	.52
- MCCB Change	4.21 (.69)	3.91 (.67)	1.53	.069	.45

*Note: ** $p <. 001$, * $p < .05$*

Table 13

One-Way ANOVA of Work Behavior, Participant Experience, and Treatment Response by High and Low Amotivation

Measures	High *M*(SD)	Low *M*(SD)	F(1,64)	Sig	Cohen's D
Work Behavior					
- Work Habits	21.33	29.59 (4.07)	2.72	.104	-2.03
- Work Quality	16.00	28.96 (5.16)	3.66	.060	-2.51
- Total Rating	120.33	150.72 (17.34)	3.05	.086	-1.75
- Global Rating	2.67	4.10 (.66)	2.33	.132	-2.17
Personal Experience					
- Interest/Enjoyment	6.14	5.79 (1.05)	.113	.738	.33
- Competence	4.55	5.00 (.84)	.274	.602	-.54
- Effort/Importance	6.47	5.32 (.66)	2.89	.094	1.74
- Value	5.33	5.75 (1.16)	.128	.721	-.36
Treatment Response					
- Week Change	.45	.45 (.69)	.001	.980	.00
- MCCB Change	2.00	2.14 (5.38)	.220	.641	-.03

*Note: ** $p <$ .001, * $p <$ .05*

Appendix

Minneapolis VAHCS Research Service July 2015

Authorization to Conduct Research
Continuing Review

Study # 4168-B
Investigator: Nienow, Tasha, PhD
Title: Randomized Trial of Two Computer Exercises to Determine How Learning Affects Thinking and Living Skills

✓	Subcommittee	Subcommittee Continuing Review Approval
	Institutional Review Board (MVAHCS)	10/16/2018
	VA Central IRB	
	IACUC	
	Subcommittee on Research Safety	08/28/2018

The above referenced research project has been approved by all applicable R&D subcommittees; you are authorized to continue this research. Approval memos from all applicable individual committees are attached to this memo, as appropriate.

ACOS/Research

Date 11/7/18