Social Judgments Based on a Series of Encounters

in Healthy and Schizophrenia Participants.

By

COLIN IWANSKI

B.A., University of North Carolina at Chapel Hill, 2011

THESIS

Submitted as partial fulfillment of the requirements

for the degree of Master of Arts in Psychology

in the Graduate College of the

University of Illinois at Chicago, 2017

Chicago, Illinois

Defense Committee:

Ellen Herbener, Chair and Advisor

Jon Kassel

Robin Mermelstein

DEDICATION

I dedicate this work to the loves of my life, Britt and Zoe, and my loving parents. Thank you for always being supportive and tolerating my nonsense.

ACKNOWLEDGEMENTS

I would like to thank the members of my committee for providing me with invaluable guidance throughout this process, and for encouraging me to improve my process of research. Thank you kindly to Ellen, Jon, and Robin for all that they have done for me.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

FIGURE PAGE

Abstract

Many studies of social perception and judgment have required individuals to make evaluations of social parameters (such as trustworthiness) based on static presentations of social stimuli (faces). In the current study, we assessed whether individuals with schizophrenia and healthy controls differed on their judgments of others based on a series of encounters, which more closely simulated the development of impressions of others based on multiple interactions over time. Twenty-eight healthy controls and 29 individuals with schizophrenia completed 25 gambling interactions with three different partners -- one who reciprocated about equally (neutral), one who gave the subject more money (positive), and one who kept more money for themselves (negative). After interacting with each partner, subjects indicated how much they liked, trusted, and would like to play again with each partner; these judgments were combined to create a social evaluation variable. Analyses found that both healthy controls and individuals with schizophrenia rated the positive partner most positively, the negative partner most negatively, and the neutral partner between these levels. Additionally, while individuals with schizophrenia and healthy controls did not differ in their ratings of gambling partners, individuals with schizophrenia had a different gambling strategy compared to healthy controls; the amount gambled with each partner did not differ for individuals with schizophrenia, whereas healthy controls gambled the most with the positive partner, gambled less with the neutral partner, and the least with the negative partner. These results suggest that individuals with schizophrenia did not adjust their behavior with the different gambling partners despite evaluating the partners similarly to the healthy controls. The results of this study are discussed within the context of social judgment and decision making.

Social judgments based on a series of encounters in healthy and schizophrenia participants Individuals with schizophrenia, on average, show deficits in social cognition tasks in comparison to healthy controls (Green 2005), and deficits in social cognition and social judgments have been linked to deficits in social outcome and social functioning (Hoe et al. 2012, Poole et al. 2001). As the annual indirect and direct costs of schizophrenia in the United States in 2002 and in 2014 were over 60 billion dollars each, with the indirect cost of unemployment in 2002 being the largest single component of the economic burden of schizophrenia, (Fitch et al. 2014; Wu et al 2005), research related to causes of this dysfunction, such as social cognitive deficits, help researchers better target opportunities for intervention and improve social functioning.

One important aspect of social judgment is how individuals determine whether they trust, or like, others, and whether or not they would choose to engage with them. Early steps in this important line of work have been to assess whether individuals with schizophrenia make different judgments about qualities like trustworthiness, or likability, than individuals without schizophrenia.

Social judgments of faces

Initial work in this area has focused on whether individuals with schizophrenia differ from healthy individuals in their assessments of trustworthiness of unfamiliar faces. Pinkham et al. (2008) found that individuals with schizophrenia who were high in paranoia rated more faces as untrustworthy than did individuals with schizophrenia who were low in paranoia or healthy controls. However, Haut and MacDonald (2009) did not replicate the finding that higher paranoia was related to lower ratings of trust in individuals with schizophrenia, and, further, found no difference in the ratings of trustworthiness of unfamiliar faces between healthy controls

and individuals with schizophrenia. These researchers also found that individuals high in persecutory delusions relied less on normative cues (such as attractiveness) to make judgments of trustworthiness than individuals low in persecutory delusions (Haut & MacDonald 2009). In Couture et al (2008), healthy controls, individuals at clinically high risk for developing schizophrenia, and individuals recently diagnosed with schizophrenia rated unfamiliar faces on how trustworthy they perceived the faces on a scale from -3 (very untrustworthy) to +3 (very trustworthy). This research group then separated the faces into two groups: trustworthy faces (faces rated +1 or higher on trustworthiness, on average across all groups) and untrustworthy faces (faces rated -1 or lower on trustworthiness, on average across all groups). Couture et al (2008), found no differences in ratings of trust for trustworthy faces between individuals at clinically high risk for developing schizophrenia, individuals recently diagnosed with schizophrenia and healthy controls. However, when examining untrustworthy faces, clinically high risk individuals rated untrustworthy faces as more trustworthy than healthy controls, with individuals with schizophrenia not rating untrustworthy faces differently than either clinically high risk individuals or healthy controls (Couture et al 2008).

Further complicating the picture, other researchers have found that individuals with schizophrenia rated unfamiliar faces as more trustworthy than did healthy controls (Baas et al 2007). Additionally, the relatives of these individuals with schizophrenia showed a similar bias, albeit somewhat attenuated (Baas et al 2007). These results highlight the mixed findings regarding ratings of trustworthiness for unfamiliar faces in individuals with schizophrenia, as well as point to paranoia related symptomatology as a potential moderating factor of ratings of trust.

Additionally, ratings of trust may also be related to the gender of the rater. In a study that asked healthy controls to rate the trustworthiness of faces previously rated on levels of trustworthiness and then divided the faces into neutral, trustworthy, and untrustworthy faces, women were found to judge trustworthy faces as more trustworthy than men did, and this effect was greater for the ratings of female faces (Mattarozzi et al 2015).

While the previous studies utilized neutral, unfamiliar faces, researchers have also begun to assess how current emotional state may influence ratings of trust (Hooker et al 2011, Kring et al 2014). Hooker et al (2011) presented healthy controls and individuals with schizophrenia with unfamiliar neutral affect faces that were preceded briefly by neutral, negative, or positive affective imagery. Both groups rated faces preceded by negative imagery lower in trustworthiness than those preceded by neutral or positive imagery. Furthermore, negative imagery had a greater effect on individuals with schizophrenia compared to healthy controls, such that individuals with schizophrenia rated faces preceded by negative imagery as more untrustworthy than healthy controls. This negative priming effect was found to be related to severity of symptoms, such that individuals with more severe positive symptoms, and in particular feelings of persecution, rated the faces preceded by negative imagery as more untrustworthy than did individuals with less severe positive symptoms (Hooker et al. 2011). Similarly, Kring et al (2014) found that neutral faces preceded by unconsciously perceived scowling or smiling faces were rated by both healthy controls and schizophrenia participants as less or more trustworthy, respectively, than neutral faces seen alone.

Social Reciprocity

Social exchange theory posits that human relationships involve a form of cost-benefit analysis and comparing alternatives for interaction (Emerson 1976). One of the major exchange

rules involved in social exchange theory is that of reciprocity. According to social psychologists, reciprocity is an important tenet upon which much of society is based (Leakey & Lewin 1978) and involves rewarding positive behaviors and punishing negative ones (Falk & Fischbauer 2006). Not only is reciprocity evaluated by the consequences of an action but also by the intentions behind such an action. This facet of reciprocity suggests why the same action may be viewed differently in different contexts. For example, being paid $20 to complete a task when others are paid the same amount will likely seem more equitable and reciprocal than one person receiving $20 for completing the same task while others are paid $200.

Individuals with first episode psychosis have impaired social reciprocity when compared to normally developing individuals as indicated by social deficits measured by the Social Responsiveness Scale questionnaire (SRS; Solomon et al 2011). In a study that utilized healthy controls and individual with first episode psychosis, healthy controls displayed fewer deficits than individuals with first episode psychosis on all sub-scales of the SRS, including awareness, cognition, communication, motivation, and mannerisms (Solomon et al 2011). For example, smiling in response to another's smile (reciprocal smiling) is one way to engage others in social interactions. Recent studies have found that individuals with schizophrenia with prominent negative symptoms may have difficulties with reciprocal smiling, and that this difficulty may be related to abnormalities in the white matter of the brain responsible for connecting key components of the mirror neuron system (Pridmore et al 2009).

Impression Formation: Negativity Effect and Priming

Research regarding impression formation or a "process by which individual pieces of information about another person are integrated to form a global impression of the individual (i.e. how one person perceives another person)" (Roeckelein 2006) has led to the discovery of

several processes involved in impression formation in typical individuals. One of these processes known as the negativity effect involves the tendency to weigh negative information more strongly than positive information when making judgments about another individual's character (Baumeister et al 2001). When provided with negative information (as opposed to positive information) about a hypothetical character, raters are more likely to be more confident of their ratings and to rate the individual in a more extreme manner (Pligt 1980). The negativity effect has also been found when researchers manipulated the characteristic of strength/weakness of a target individual, such that strong (reflected in traits such as powerful and confident) negative behavior carries more weight in judgments of likeability compared to strong positive behavior (Vonk 1996). Negative initial impressions have been found to be more stable than positive impressions, in part, potentially due to the negativity effect (Denrell 2005).

The process of forming an impression, similar to ratings of trustworthiness, can be primed and/or manipulated by emotional and goal context. Researchers have found that displaying positive or negative idioms before displaying a neutral affect face led to congruent ratings of favorability, such that faces preceded by negative idioms were rated less favorably than faces preceded by positive idioms (Zhong 1998). Additionally, asking individuals to adopt an impression formation mindset led individuals to remember significantly more descriptive words than individuals asked to memorize the list of descriptors (Hamilton 1980). The researchers in this study suggested that this finding supported the idea that forming an impression of someone involves integrating information into a structural organization, leading to more developed associations between the words in the list and increasing word recall.

Interactional trust and gambling tasks.

A number of more recent studies have started to use interactional tasks -- particularly, gambling tasks -- to assess whether individuals with schizophrenia and healthy controls differ in their judgments about the trustworthiness of others based on the other's behavior toward them, rather than making judgments based on physical appearance and emotional context. For example, Campellone and colleagues (2016) developed a modified trust game in which individuals engaged with partners who either returned more (trust reciprocal) or less (trust abusing) points than the subject. Individuals with schizophrenia rated both the trust reciprocal and the trust abusing partners as less trustworthy than healthy controls rated these same partners during the initial stage of the task (Campellone et al 2016). The researchers suggested that this was due to individuals with schizophrenia being less sensitive to positive outcomes, and more sensitive to negative outcomes, which both contributed to lower trustworthiness ratings for the partners.

Notably, this study did find that ratings of trust were related to functional outcome, such that for individuals with schizophrenia, on average, greater trust placed in both untrustworthy and trustworthy partners was associated with greater social network functioning. Additionally, this study revealed that negative symptoms were negatively associated with trust placed in the trust reciprocal partner, such that greater severity of negative symptoms was associated with less trust placed in the trust reciprocal partner.

Similarly, in a multi-round interactive trust game, individuals with schizophrenia and their healthy relatives exhibited less trust than healthy controls (Fett et al 2012). Over the course of the game, individuals with schizophrenia did not modify their trusting behavior using the partner’s feedback or information about the trustworthiness of their partner. However, the

healthy relatives of these individuals with schizophrenia were able to modify their trusting behavior in similar ways to healthy controls, despite exhibiting less trust overall (Fett et al 2012).

A variety of paradigms that focus on learning and decision-making in a social context, have been developed in social psychology and behavioral economics, and include tasks, such as the Prisoner's Dilemma, the Gift-Exchange Game, the Dictator Game, the Centipede game, and the Ultimatum game. In the Ultimatum Game (Guth et al 1982), participants take turns as being the Proposer and the Responder. The role of the Proposers is to offer to their counterparts, the Responders, a division of a certain amount of money. If the Responder accepts the proposed division of money, each partner receives the agreed amount, but if the Responder rejects the proposal, then neither partner receives any money. In this task, it is in the best interest of the individuals to work together, but the Proposer has greater economic power over the Responder, i.e. it is in the economic best interest of the Responder to accept even proposals at which they are at a disadvantage because receiving some money is economically superior than receiving no money, and it is in the best interest of the Proposer to exploit the economic advantage he/she has by proposing deals that maximize the amount of money he/she receives. In a study utilizing this task, individuals with schizophrenia did not perform differently from healthy controls when it came to accepting offers proposed to them, but they did not exploit their economic advantage when they were the ones proposing the economic offers as much as healthy controls (Agay et al 2008). In a study of individuals high in schizotypal traits using the Ultimatum Game, greater severity of positive and disorganized schizotypal symptoms were associated with poorer bargaining behavior, as evidenced by individuals with greater severity of positive and disorganized schizotypal symptoms proposing to give more money to their partners when they were the Proposer compared to those with less severe positive and disorganized schizotypal

symptoms (Wout & Sanfey 2011). Notably, in these tasks, "ideal" behavior is to take the most advantage of one's opponent and keep the most money for oneself -- and individuals with schizophrenia or schizotypal traits did more poorly at this, by being more equitable in the money distribution with their partner when they were in control. Although this might be due to problems in optimal decision-making, it could also be due to being less competitive about money, and/or valuing the relationships over their optimal win. However, most economic game studies do not assess these variables.

In summary, most studies of trust in individuals with schizophrenia have focused on judgements of trustworthiness of faces, and have shown that these ratings are influenced by emotional context and symptoms. However, they have not addressed how these judgments may occur in natural situations as subjects gain information about other people through repeated contact. Several interactional (gambling) studies have been conducted with individuals with schizophrenia to date, which address repeated contact, but many have been analyzed in terms of whether individuals make "optimal" economic decisions, and have not addressed how a history of interaction with different partners influences individual's perceptions of their partners.

In the current task, we address these issues by having participants complete multiple interactions with three different partners who differ in their feedback characteristics. We assess both their "gambling" behavior during the interaction with each partner, as well as assessing their social evaluation of each partner: how much they liked the partner, how much they trusted the partner, and how much they would like to play again with the partner. In this way we address the missing components of many of the studies above, by assessing how participants interact with different partners that have differing patterns of behavior and by assessing how well the participants develop a social evaluation of the partner based on their partner’s behavior.

Current Study

As noted above, most studies of trust in schizophrenia subjects to date has focused on assessments of trustworthiness based on physical appearance (Baas et al. 2007, Haut & MacDonald 2009, Pinkham et al. 2008). However, in many situations, people learn who they can and cannot trust via the accumulation of positive and negative experiences with the other person over time. The Character Assessment Gambling Task (CAGT) focuses on this aspect of trust development by having participants complete 25 gambles (similar to a modified trust game using money instead of points) with their partner, and making ratings of their partner at the end of the gambling with each partner. Social evaluation ratings are thus expected to reflect the individual's accumulated information about the partner's behavior across the history of gambles, including the computer partner's tendency to share the money equally, to keep more money for themselves, or offer more money to the subject. The current task also allowed us to assess changes in behavior toward the other (via gambling choices) over time. In addition, in the current task, subjects completed 25 interactions with 3 different partners -- one that reciprocates equally, one who on average gives more money to the subject, and one who on average keeps more money for themselves. By having these three conditions, we can also assess whether subjects develop different impressions of others based on their interaction histories,

The hypotheses tested in this study are as follows: 1) based upon Agay et al (2008), which found that when proposing offers in the ultimatum game, healthy controls made more than individuals with schizophrenia, on average, we hypothesize that healthy controls will make more money during the CAGT compared to individuals with schizophrenia, as the proposer role of the ultimatum game is similar to (but not the same as) the role of the participant in the CAGT; 2) based on the Hooker et al (2011) finding that emotional state priming influences ratings of

trustworthiness, we hypothesize that for both healthy controls and individuals with schizophrenia the positive partner will have the most positive social evaluation ratings, the negative partner will have the most negative social evaluation ratings, and the neutral partner ratings will be between the positive and the negative partner ratings; 3) additionally based on a finding from Hooker et al. (2011) in which individuals with schizophrenia rated faces preceded by negative affective imagery as more untrustworthy than healthy controls rated faces preceded by negative affective imagery, as well as findings from Campellone et al (2016) that individuals with schizophrenia rated both trust reciprocal and trust abusing partners as less trustworthy than healthy controls rated these same faces, we hypothesize that individuals with schizophrenia will rate the partners, especially the negative partner, as less trustworthy than healthy controls rate the partners; 4) as previous research has found that greater severity of positive and negative symptoms was associated with decreased performance on gambling tasks (Turnbull et al 2006; Cella et al 2011) and that greater severity of positive and negative symptoms was associated more negative trust evaluations (Hooker et al 2011; Pinkham et al 2008; Campellone et al 2016), we hypothesize that greater severity of positive and negative clinical symptoms as measured by the PANSS will predict making less money, less amount gambled, and more negative social evaluation ratings on the CAGT; 5) Based on the interactional and economic game literature suggesting different behavioral strategies between healthy controls and schizophrenia and that individuals with schizophrenia modified their behavior less with different partners (Agay et al 2008; Campellone et al 2016; Fett et al 2012), we hypothesized that individuals with schizophrenia would not adjust the amount of money gambled with the different partners as much as would healthy subjects. Further exploratory analyses focused on whether amount of money made predicted social

evaluation ratings and a cross correlation lag analysis to determine how amount of money returned on the previous trial related to the amount of money gambled on the subsequent t

METHOD

Participants

A total of 28 community controls and 29 individuals meeting DSM-IV TR criteria for a schizophrenia spectrum disorder (schizophrenia or schizoaffective) participated in this study. To be eligible for this study, community controls had to meet the following criteria: ages 18-65, no past or current psychotic disorder or have met criteria for a mood disorder in the past 5 years, no history of mental retardation, no head injury with loss of consciousness greater than 15 minutes, and no neurological abnormalities that might affect cognitive performance. Schizophrenia group participants had to meet the following conditions: ages 18-65, DSM-IV TR diagnosis of schizophrenia or schizoaffective disorder, no history of mental retardation, no head injury with loss of consciousness greater than 15 minutes, and no neurological abnormalities that might affect cognitive performance.

Demographic information is included in Table 1. After comparing demographic variables between the healthy controls and the schizophrenia group using chi-square analyses and independent samples t-tests, the groups were found to be inequivalent on the following variables: education, such that the schizophrenia group was less educated than the healthy control group, Wide Range Achievement Test 3 (WRAT-3) performance, such that individuals with schizophrenia had lower scaled scores, and number of individuals that identified their race as “Other”, such that there were greater numbers of individuals that identified their race as “Other” in the healthy control group. To ensure that this difference in the number of individuals who identified their race as “other,” was not related to differences in performance on the CAGT between the groups, this dummy coded variable was included initially as a covariate in all main analyses. As this variable was not

significantly related to any of the outcome variables in the analyses, it was not included in any of the final analyses. Education was also not found to relate to any of the outcome variables in the analyses when included as a predictor, so it also was not included in the final analyses. However, when WRAT-3 scaled scores were used as a predictor of outcome variables, they significantly predicted amount of money gambled and amount of money made on the CAGT, such that higher WRAT-3 scaled scores predicted greater amount of money gambled and amount of money made. As such, WRAT-3 scaled scores were used as a covariate in all analyses.

Recruitment and Procedure

Participants were recruited at the University of Illinois at Chicago (UIC) through ads posted in the Psychiatry department, internet postings, and participant referrals. Individuals were screened via telephone to assess their eligibility and potential participants were then scheduled for the study. Participants attended a baseline and a follow-up visit for this study in the Psychiatry department of UIC, and they were monetarily compensated for their participation. The CAGT was administered in full at the baseline visit. Controls were recruited to match the schizophrenia group on demographic variables including, gender, race, and education.

Measures

Character Assessment Gambling Task (CAGT)

The CAGT is designed to measure how a participant's social evaluation of another individual is influenced by a series of gambling interactions. The measure's instructions describe a gambling task in which participants are instructed to make as much money as possible and that they will not be able to keep the money that they do not

gamble. The task consists of 25 trials with 3 different computer "partners" (neutral, negative, and positive), although subjects are not informed that these partners might behave differently. In each trial, participants are told to invest up to $10, which is given to the partner and doubled. The partner then returns a portion of the money to the participant based on the partner's previously determined algorithm and then the partner keeps the rest. The amount of money returned on each trial and the cumulative total of money made on all trials with a partner are displayed on the screen.

Each partner is assigned a name and neutral affect facial image. The facial images were selected from the NimStim Face Stimulus Set (Tottenham et al 2009) and were matched to participant race and gender to decrease potential in-group/out-group bias. The faces within each race/gender sub-group were pseudo-randomized, such that stimulus faces for a given race/gender subgroup were assigned to different partner types (neutral, negative, positive) for different participants.

Subjects engaged with each partner for 25 gambling trials in a row. After completing these gambles, participants are asked how much they trusted the partner, liked the partner, and would like to play again with the partner (termed "social evaluation ratings"), on a Likert scale from 1 ("not at all") to 9 ("very much") with higher scores indicating more favorable evaluations of the partner. This procedure is repeated with each partner. The partners were presented in the following order for all participants: neutral, negative, positive. The neutral partner's overall returns ranged between 87% and 110% of the money invested (average of 99% per gamble over all participants and trials), while the negative partner's overall returns ranged between 47% and 94% of the money invested (average of 71% per gamble over all participants and trials) and the positive partner's

overall returns ranged between 110% and 215% of the money invested (average of 141% per gamble over all participants and trials).

Wide Range Achievement Test-3 (WRAT 3)

The Wide Range Achievement Test-3rd Edition (WRAT 3; Wilkinson 1993) reading subtest, is a reading test used to assess reading achievement and was used as a proxy for pre-morbid intellectual ability. WRAT 3 scaled scores were used as covariates in the following analyses. WRAT 3 scaled scores have an average of 100 and a standard deviation of 15, with more than half of all individuals' subtest scores falling between 85 and 115.

Positive and Negative Syndrome Scale (PANSS)

The Positive and Negative Syndrome Scale (PANSS; Kay et al 1987) is a semi-structured clinical interview designed to assess the presence and severity of positive, negative, and general clinical symptoms in a schizophrenia population. It has been used extensively in research studies and has been found to have excellent interrater reliability (Bell et al 1992). The PANSS was scored by experienced researchers who were trained to a kappa-reliability of 0.80 or higher.

Preparation for Analysis

We planned to use a mixed levels modeling approach to test research hypotheses, due to each participant interacting with three different partners, creating both between subjects (diagnostic group) and within subjects (partner type) variables. To assess the appropriateness of this approach for this data set, we conducted a missing value analysis to determine whether there was any pattern to the missing values in the data set. A non-significant Little's MCAR test supported the non-systemic pattern of missing data, χ^2 (4, N = 56) = 5.63, p = .23.

Dummy coded variables were created to represent the 3 different partners, the diagnostic groups, and the different racial groups. For the following analyses, the diagnostic reference group was healthy controls, the reference partner changed depending upon the analysis, and the reference group gender was male. Demographic/background characteristic differences were noted previously and can be seen in Figure 1.

Before running the analyses, the researchers examined the data for potential violations of the assumptions of normality, homoscedasticity and multicollinearity, and no violations were found. While assessing the relationships between the different partner rating variables in the study, we found that our ratings of social evaluation ("like", "trust", and "like to play again") were highly correlated. The average measure Intraclass Correlation Coefficient (ICC) between the three ratings was .92, $F(170, 340) = 12.42$, $p < .001$. Due to the highly correlated nature of these variables, the decision was made to create a composite rating of overall social evaluation by averaging across the ratings in order to avoid repetitive analyses that may be assessing a similar overlapping construct. This social evaluation variable was used for all subsequent analyses involving the ratings of the computer partners.

Analytic Approach

All analyses used mixed levels modeling due to different partner types (neutral, negative, positive) being nested within each participant. Additionally, as gender had been found to be associated with ratings of trust in a prior study (Mattarozzi et al 2015), gender was used as a covariate in all analyses, along with WRAT 3 scaled scores, as this variable was found to predict amount of money gambled and amount of money won on the CAGT.

To test hypothesis one, that healthy individuals would make more money than individuals with schizophrenia, we used a mixed modeling approach in which group status was used to predict amount of money made overall, and a group by partner interaction was added to determine if the relationship was constant across all partners using the negative partner as the reference group.

Hypothesis two, which predicted that healthy controls and individuals with schizophrenia would assign the positive partner the most positive social evaluation ratings, the negative partner the most negative social evaluation ratings, and the neutral partner in between, was tested by comparing the social evaluation ratings between the different partners (neutral, negative, and positive) across diagnostic group using mixed levels modeling. Due to the previous findings in the Hooker et al (2011) study that found negative, neutral, and positive affect priming of neutral faces led to differences in levels of trust for each emotional valence across all participants, we used dummy coding to compare the different partners with the neutral partner being the reference group.

To test hypothesis three, that individuals with schizophrenia would rate their partners more negatively than healthy controls, we used a mixed modeling approach in which diagnostic group status was used to predict social evaluation ratings overall, and group by partner interactions were added to determine if the relationship was constant across all partners. Due to the Hooker et al (2011) study that found that ratings of trust differed the most between healthy controls and individuals with schizophrenia for the face preceded by negative imagery, we used the negative partner as the reference group in this analysis.

Hypothesis four, which predicted that greater positive and negative symptom severity, as assessed by the PANSS, would predict making less money, gambling less money, and lower social evaluation ratings on the CAGT, we used a mixed modeling approach to examine all previous analyses using PANSS positive and negative symptom ratings, in independent analyses, as additional predictor variables.

To test hypothesis five, that individuals with schizophrenia would not adjust the amount of money they were gambling with each partner, while healthy controls would adapt the amount of money gambled with the different partners, we used a mixed modeling approach using group status to predict amount of money gambled overall and then included the group by partner type interaction term to determine if the relationship was constant across all partners. We also assessed whether amount of money made with a partner predicted social evaluation ratings across the diagnostic groups using mixed levels modeling. Additionally, a cross correlation lag analysis was conducted to determine how the amount of money returned by a computer partner returned on a prior gamble affected participants' subsequent gamble.

RESULTS

To test hypothesis one, that healthy individuals would make more money than individuals with schizophrenia, a mixed effects model was conducted to determine the effect of diagnostic group on total amount of money made on the CAGT across all partner types controlling for gender and WRAT-3 scaled scores. The analysis revealed that diagnostic group did not predict amount of money made overall (Estimate = -8.82, SE = 12.81, p = .49), while WRAT-3 scaled scores did predict amount of money made overall (Estimate = .97, SE = .47, p = .04), such that every unit increase in WRAT-3 scaled scores was associated with a .97 increase in dollars made overall.

In order to determine whether the amount of money made with each partner was consistent for each diagnostic group as a part of hypothesis one, an analysis comparing performance across the different partners using healthy controls' performance with the negative partner as the reference group and including predictors of partner type and the interaction of the partners and diagnostic group, as well as controlling for gender and WRAT-3 scaled scores, found a significant main effect of positive (Estimate = 118.84, SE = 10.94, p < .001) and neutral partner type (Estimate = 54.14, SE = 10.94, p < .001) , a significant main effect of WRAT-3 scaled scores (Estimate = .97, SE = .47, p = .04), a significant interaction between diagnostic group and the positive partner (Estimate = -49.48, SE = 15.20, p = .001), and a trend level interaction between diagnostic group and the neutral partner (Estimate = -25.74, SE = 15.20, p = .09). These results suggested healthy controls made more money with the positive and neutral partner as compared to the negative partner, increases in WRAT-3 scaled scores were associated with increases in

amount of money made, and individuals with schizophrenia made significantly less money with the positive partner compared to healthy controls.

Running this same analysis using individuals with schizophrenia as the reference group instead of healthy controls revealed a significant main effect of positive (Estimate = 69.37, SE = 10.55, $p < .001$) and neutral partner type (Estimate = 28.40, SE = 10.55, $p = .01$) in addition to the previously mentioned interactions between diagnostic group and the positive and neutral partners, as well as the relationship with WRAT-3 scaled scores. These results suggested that both healthy controls and individuals with schizophrenia made more money with the positive and neutral partners than with the negative partner, and that individuals in the two groups differed significantly in the amount of money they made with the positive partner.

In order to determine the magnitude of how the diagnostic groups differed in how much money they made with the positive partner, we used a mixed level modeling analysis conducted to test the simple slopes of the interaction between diagnostic group and the positive partner. This analysis revealed that the slope representing amount of money made with the positive partner for healthy controls and individuals with schizophrenia was different than 0, such that healthy controls made more money with the positive partner than individuals with schizophrenia made with the positive partner (Estimate = 35.54, SE = 15.86, $p = .03$). Full results of the initial analysis are shown in Table 2, and a graph representing the relationship between partner type and amount of money made for the diagnostic groups is shown in Figure 1.

To test hypothesis two, that social evaluation ratings across diagnostic groups would differ between the different partners, such that the positive partner would be rated

the highest, the negative partner would be rated the lowest, and the neutral partner would be rated between these, mixed level modeling was used. The analysis using dummy coded variables representing the partners and controlling for gender and WRAT-3 scaled scores revealed that social evaluation ratings for both the positive partner (Estimate = 1.41, SE = .34, $p < .001$) and the negative partner (Estimate = -2.18, SE = .34, $p < .001$) differed significantly from the neutral partner across all participants, such that the positive partner had significantly higher social evaluation ratings than the neutral partner and the negative partner had significantly lower social evaluation ratings than the neutral partner. Full results of this analysis are shown in Table 3.

To test hypothesis three, that individuals with schizophrenia would have more negative social evaluation ratings for the partners overall, and with the individual partner when compared to healthy controls, we used a mixed level modeling analysis using diagnostic group as a predictor and controlling for gender and WRAT-3 scaled scores. This analysis revealed that diagnostic group did not significantly predict social evaluation ratings over all partners (Estimate = -.48, SE = .41, $p = .24$). To determine if social evaluation ratings differed between diagnostic groups across the different partners, the analysis used dummy coded variables representing the different partner types and diagnostic group, and the interaction of partner types and diagnostic group to predict social evaluation ratings while controlling for the effects of gender and WRAT-3 scaled scores. While both the positive (Estimate = 3.69, SE = .48, $p < .001$) and neutral (Estimate = 2.81, SE = .48, $p < .001$) partners predicted greater social evaluation ratings compared to the negative partner, results revealed that diagnostic group did not significantly predict social evaluation ratings with any of the partners. However, there was a trend level

difference found for the neutral partner (Estimate = -1.22, SE = .67, p =.07), such that individuals with schizophrenia rated the neutral partner more negatively than healthy controls rated the neutral partner at a trend level. The full results of this analysis are reported in Table 4.

To test hypothesis four, that greater severity of positive and negative symptoms would be associated with less money made, less money gambled, and lower social evaluation ratings, we first used a mixed level modeling analysis using positive symptom PANSS ratings as predictors and controlling for gender and WRAT-3 scaled scores. This analysis revealed that positive symptom ratings on the PANSS did not significantly predict social evaluation ratings, amount of money gambled, or amount of money made on the CAGT with any of the partners. A mixed level modeling analysis using negative symptom PANSS ratings as a predictor and controlling for gender and WRAT-3 scaled scores revealed that negative symptoms significantly predicted social evaluation ratings for the positive partner (Estimate = -.16, SE = .09, p = .04) such that the higher the PANSS ratings for negative symptoms (more severe), the lower the social evaluation ratings of the positive partner. Ratings of negative symptoms on the PANSS did not predict amount of money made on the CAGT or amount of money gambled on the CAGT for any of the different partners. All analyses that were found to be previously significant remained so after including positive and negative PANSS ratings as predictors, and no analyses that were previously found to be nonsignificant became significant after including these PANSS ratings.

To test hypothesis five, that individuals with schizophrenia would not alter the amount of money they gambled with the different partners, a mixed effects model was

conducted. To determine if diagnostic group predicted amount of money gambled on the CAGT, while controlling for gender and WRAT-3 scaled scores, a mixed level modeling analysis revealed that diagnostic group did not predict amount of money gambled when averaged across all partners (Estimate = -6.34, SE = 12.76, p = .62). An analysis comparing performance across the different partners using healthy controls' performance with the negative partner as the reference group and including predictors of partner type and the interaction of the partners and diagnostic group, as well as controlling for gender and WRAT-3 scaled scores, found a main effect of the positive (Estimate = 55.89, SE = 9.22, p < .001) and neutral partner (Estimate = 27.48, SE = 9.22, p = .004), as well as a significant relationship between diagnostic group and the positive partner (Estimate = -47.44, SE = 12.81, p < .001) and a significant relationship between diagnostic group and the neutral partner (Estimate = -27.48, SE = 12.81, p = .03). These results suggest that healthy controls gambled significantly more money with the positive and neutral partner than with the negative partner, as well as finding that individuals with schizophrenia gambled less money with the positive and neutral partners than the healthy controls gambled with the positive and neutral partners, respectively. Full results of this analysis are shown in Table 5.

In order to determine if the amount of money gambled with the different partners differed for each diagnostic group, mixed effects modeling analyses were conducted, setting the reference group as the neutral partner for each diagnostic group. For healthy controls, the amount of money gambled with both the positive (Estimate = 28.41, SE = 9.22, p = .003) and negative partners (Estimate = -27.48, SE = 9.22, p = .004) was significantly different than amount of money gambled with the neutral partner, such that healthy

controls gambled more money with the positive partner and less money with the negative partner compared to the neutral partner. For individuals with schizophrenia, the amount of money gambled with the positive (Estimate = 8.45, SE = 8.90, p = .34) and the negative partners (Estimate < .001, SE = 8.90, p = 1.00) was not significantly different from the amount of money gambled with the neutral partner. A graph representing the relationship between partner type and amount of money gambled for the diagnostic groups is shown in Figure 2.

An exploratory analysis was conducted to determine if the amount of money made during the CAGT predicted social evaluation ratings. A mixed level modeling analysis using amount of money made as a predictor of ratings of social evaluation and including diagnostic group and the interaction of diagnostic group and amount of money made, as well as controlling for gender and WRAT-3 scaled scores revealed that the amount of money made significantly predicted social evaluation ratings (Estimate = .02, SE = .003, p < .001), such that the more money an individual made, the more positively he/she rated their partner on social evaluation, overall. This relationship between amount of money made and ratings of social evaluation did not differ depending on diagnostic group status (Estimate < .001, SE = .005, p = .97).

A cross correlation lag analysis was conducted to determine the extent to which the amount of money returned on the previous trial predicted subject gambling on the next trial, as a function of both partner type and diagnostic group. Due to the exploratory nature of this analysis, tukey corrections were performed for each following p value, and as assumptions of sphericity were also violated, Greenhouse-Geisser corrections to degrees of freedom are listed. The mixed analysis of variance showed that there was a main effect of

diagnosis, $F(1, 45) = 6.06$, $p = .02$, partner type, $F(1.96, 88.20) = 5.01$, $p = .001$, and the interaction of diagnosis and partner type, $F(1.96, 88.20) = 4.05$, $p = .02$.

As interpreting main effects can be misleading when there is a significant interaction effect, only the significant interaction of diagnosis and partner type were followed up in this analysis. The pairwise t-tests used to follow up the interaction of partner type and diagnostic group revealed that the relationship between amount of money returned by the computer partner on a trial and the amount of money gambled by the participant on the following trial differed between healthy controls and individuals with schizophrenia for the negative partner alone, $t(220) = -2.11$, $p = .04$, such that the gambles of individuals with schizophrenia on a trial were less related to the amount of money returned by the computer partner on the previous trial ($r = .21$) compared to the gambles of healthy controls ($r = .45$). After removing the negative partner from the analysis, both the main effect of diagnosis and the interaction of diagnosis and partner type became non-significant, while the effect of partner type remained significant, $F(1, 46) = 9.54$, $p = .003$. These findings show that the interaction of diagnostic group and partner type on the cross correlation lag analysis of amount of money returned to subsequent amount of money gambled on the CAGT was driven by the diagnostic groups' differential performance with the negative partner.

As a way of determining if the effects found in this study were related to the ordering of the partners and/or the baseline perceived trustworthiness of the faces used, additional control participants were presented with alternate ordering of the partners, as well as using faces that had been matched for perceived trustworthiness from the Chicago Face Database (Ma, Correll, & Wittenbrink 2015). Additional control participants were

students from an introductory psychology course at the University of Illinois at Chicago. Participants were shown faces that corresponded to their self-identified gender (male or female) and ethnicity (Caucasian, African-American, Asian, and Hispanic). The possible ethnicity options were limited to these four groups as these were the four ethnic groups represented in the Chicago Face Database. Individuals who did not identify with any of the aforementioned ethnicities or genders were asked to select which of these groups they most identified with. Thirty-eight undergraduate participants were administered the CAGT with one of two possible partner orders: 1) neutral partner, negative partner, positive partner or 2) neutral partner, positive partner, negative partner. As each subject entered the study, they were assigned to gender/race group, and then to a partner order, with partner order alternating between the two possible orders.

Eighteen participants completed order 1, and 20 participants completed order 2. Independent samples t-tests were used to compare the groups based on amount of money made, amount of money gambled, and social evaluation ratings for each partner. No significant differences were found between participants in the different orders. The results of these analyses are found in Table 6.

DISCUSSION

The results of this study suggest that, although individuals with schizophrenia and healthy control subjects developed similarly differentiated levels of trust for their positive, negative, and neutral gambling partners, this difference was expressed in a "tit for tat" gambling strategy in the healthy controls, but not in the individuals with schizophrenia. Healthy controls gambled more with the positive partner than individuals with schizophrenia gambled with the positive partner, and healthy controls bet significantly different amounts of money with each partner, gambling the most money with the positive partner, less money with the neutral partner, and the least money with the negative partner, while individuals with schizophrenia did not bet different amounts of money with the different partners. This finding suggests that while healthy controls adapted their gambling strategy by adjusting the amount of money that they gambled to match the strategy of their partner, individuals with schizophrenia did not, despite having similar evaluations of the partner. This discrepancy between gambling behavior and social evaluation for individuals with schizophrenia suggests a disconnect between the way they interact with and evaluate others. There could be a number of reasons for the disconnect between the participants with schizophrenia's evaluations of their partners, and their behavior with their partners. These issues will be discussed at greater length below.

Research Hypotheses

Our first hypothesis, that individuals with schizophrenia would make less money on the CAGT compared to healthy controls, was partially supported by the results of this study. Despite the diagnostic groups displaying different betting strategies, diagnostic group did not predict amount of money made when compared across all partners on the

CAGT. Notably, individuals with schizophrenia made significantly less money with the positive partner than healthy controls made with the positive partner, but the diagnostic groups did not significantly differ from each other in the amount of money that they each made with the neutral or negative partners. Healthy controls making more money with the positive partner compared to individuals with schizophrenia may reflect an adaptive response on behalf of the healthy controls to recognize the monetary advantage of gambling with this partner, whereas individuals with schizophrenia were unable to exploit the economic advantage of gambling greater amounts with the positive partner. This difference between healthy controls and individuals with schizophrenia in recognizing and exploiting an economic advantage is similar to the findings of Agay et al (2008), which found that individuals with schizophrenia did not exploit an economic advantage in a trust task as effectively as healthy controls.

Hypothesis two, that the social evaluation ratings of the partners across diagnostic groups would differ, such that the positive partner would have the most positive ratings, the negative partner would have the least positive ratings, and the neutral partner would be rated in-between these two partners was fully supported by the results of this study. This finding is consistent with the finding from Hooker et al (2011), as it suggested that experiences that increase reward (positive affective imagery or increasing amounts of money returned by the partner) increase social evaluation ratings, while experiences that decrease reward (negative affective imagery or decreasing amounts of money returned by the partner) decrease social evaluation ratings. A primary purpose of the gambling portion of the CAGT was to determine how partners' behavior (operationalized as the amount of money the partner returned to them) would influence the subjects' assessments of their

interaction partners. Finding that hypothesis 2 was supported by the results of this study suggests that the gambling portion of the task was successful in influencing the social evaluation ratings of the partners by the participants in the study. Additionally, the exploratory analysis which found that the amount of money made predicted ratings of trust across both diagnostic groups further supported the finding that the gambling portion of the task successfully influenced social evaluation scores. This exploratory analysis did not find any diagnostic group differences in the relationship between amount of money made and social evaluation of partners, suggesting that both groups effectively utilized this information.

Hypothesis three, which proposed that individuals with schizophrenia would have lower social evaluation ratings of the different partners compared to healthy controls, was not supported by the results of this study. Although our hypothesis was based on the Hooker et al (2011) and Campellone et al (2016) findings, other studies comparing trust/social evaluation in schizophrenia and healthy populations have not found significant differences between groups (Haut & MacDonald 2009). This result is somewhat surprising, as Campellone et al (2016) used a similar task design to the CAGT, in which participants interacted with computer partners that were trust abusing or trust reciprocal, and found that individuals with schizophrenia rated both partners as less trustworthy than healthy controls rated these partners. Their sample was more highly educated (Average years of education = 14.7) and had higher estimated IQ scores (105.4) than the sample used in this current study (Average years of education = 12.72; Estimated FSIQ = 91.79). As estimated IQ was found in the current study to predict gambling behavior on the CAGT, it is possible

that differences in education and IQ scores between participants in the current study and Campellone et al (2016) may have led to the discrepant findings.

Hypothesis four, which stated that greater severity of positive and negative symptoms of schizophrenia as measured by the PANSS would predict more negative social evaluation ratings, less money gambled, and less money made on the CAGT was only minimally supported. Negative symptom severity was associated with social evaluation ratings for the positive partner only, such that as negative symptoms increased, social evaluation ratings of the positive partner decreased. This relationship mirrors a finding from Campellone et al (2016), which found that negative symptoms were negatively associated with trust for trust reciprocal partners, such that greater severity of negative symptoms was associated with less trust. No other relationships between positive or negative symptoms and performance on the CAGT were found. While several studies have found that ratings of trust and performance on gambling tasks is related to clinical symptom severity (Turnbull et al 2006; Cella et al 2011; Pinkham et al 2008; Haut & MacDonald 2009; Hooker et al 2011), other studies that assessed ratings of trust or performance on gambling tasks did not report any effect of symptoms, either because they did not test for it, or they did not find any effect of symptoms (Shurman et al 2003; Baas et al 2007; Couture et al 2008; Fett et al 2012; Brown et al 2014). Additionally, the current sample of individuals with schizophrenia had an average total PANSS score of 66.36 (SD = 15.83), which when compared to categories of the Clinical Global Impressions ratings, a measure of clinical symptom severity, can be classified between mildly and moderately ill (Leucht et al 2005). It is possible that symptoms need to reach a certain threshold before affecting performance on measures such as the CAGT. Further research should be

conducted to determine if there is a necessary symptom threshold needed to predict performance on the CAGT and similar gambling and trust/social evaluation measures. The results of hypothesis five were discussed previously.

An exploratory analysis was conducted to determine how the amount of money returned by a partner on a trial was related to the amount of money gambled by the participant on a subsequent trial. This analysis revealed that the amount of money returned by the negative partner on a given trial was significantly more strongly related to the amount of money gambled on the following trial for healthy controls compared to the amount of money gambled by individuals with schizophrenia. This suggests that healthy controls were more responsive, and perhaps more reciprocal, than individuals with schizophrenia when gambling with the negative partner. These results suggest that healthy controls were more sensitive than individuals with schizophrenia to the behavior of the negative partner. This result adds to the mixed findings in the literature. While some studies have found that individuals with schizophrenia are more sensitive to negative affect or negative feedback compared to healthy controls when rating the trust of unfamiliar faces or partners in a modified trust task (Hooker et al 2011, Campellone et al 2016), another study found that individuals with schizophrenia did not modify their behavior with different partners, despite being given information about the relative trustworthiness of their partners (Fett et al 2012). The Fett et al (2012) study finding was consistent with the findings of the current study, such that the behavior of these individuals was not affected by the level of trust for their partners.

There are a number of different potential reasons for the differences in behavior between individuals with schizophrenia and healthy subjects. One hypothesis is that

individuals with schizophrenia experience a disconnect between their evaluation of situations and their behavior in those situations. Research focusing on motivation in individuals with schizophrenia have found results similar to ours, suggesting a disconnect between affective evaluation and behavior. Specifically, in a signal detection paradigm with differentially valued reinforcements and punishments, individuals with schizophrenia did not differ from healthy controls with respect to sensitivity to reward, but did differ in their behavioral responses to these differing levels of reinforcement (Heerey et al 2008). In this study, individuals with schizophrenia gave the possibility of losses significantly less weight in the decision making process compared to healthy controls. In sum, the potential to lose during a given trial of this task had less influence on the behavior of individuals with schizophrenia than the behavior of healthy controls (Heerey et al 2008).

Another study conducted by the same research group found that the behavior of individuals with schizophrenia correlated less with their subjective evaluation of affective stimuli than that of healthy controls (Gold et al 2008). Subjects were presented with positive, negative, and neutral stimuli, and could increase or decrease the probability of future presentation of each stimulus by sustained button-pressing of either a button that increased the likelihood they would see the image again or a different button that decreased the likelihood of seeing the image again. The rate of pressing the "increased likelihood" button was used as an indicator of how much they wished to see the image again (Gold et al 2008). The study found that the correlation between rate of button pressing and subjective pleasantness of the images was lower for individuals with schizophrenia compared to healthy controls, despite the groups rating the subjective pleasantness of the images similarly (Gold et al 2008). These findings corroborate the

results of the current study that showed a disconnect between the evaluation of affective information and the behavior of participants.

There are several limitations of the current study. First, as the current sample in this study is 57 participants, it is unclear if the study had enough power to detect all potential effects. Future studies should collect larger samples to address this issue.

The task itself has some weaknesses. Further investigation is required to ensure that the faces used in the task do not differ in inherent likability or trustworthiness. In this task, we attempted to correct for this potential influence by having the faces "rotate" so that each face would be presented as a "good" partner, a "bad" partner, or a "neutral" partner with different subjects. Another potential weakness is that the partners in the task were always presented in the same order (1-neutral, 2-negative, 3-positive). As there were no counterbalanced conditions, one possible interpretation of the results is that they are due to ordering effects of the partners.

In order to assess whether inherent or baseline face trustworthiness or order of the computer partners influenced the results of the current study, additional control participants were recruited and were administered the CAGT using faces that were selected for equivalent baseline ratings of trust from the Chicago Face Database stimuli set and were administered one of two different orderings of partners. Analyses designed to detect differences in money made, money gambled, and social evaluation of the partners revealed no statistically significant differences between individuals who were administered different orders. This null finding lends support to the credibility and interpretability of the findings of the current study.

Overall, this study contributed to both the trust and decision making literature involving individuals with schizophrenia and healthy controls in a number of ways. It introduced the CAGT as a more ecologically valid measure of decision making and trustworthiness based on the accumulation of information about one's interaction partner over time. Healthy and schizophrenia participants demonstrated quite similar social evaluations of their partners, and these evaluations were closely associated with the partner's behavior toward the subject. Additionally, the finding that individuals with schizophrenia did not alter their gambling strategy based upon the behavior of the computer partners, whereas healthy controls did, supports findings in the literature suggesting that individuals with schizophrenia have greater difficulty adapting their behavior to different contexts. Future research could expand upon these findings by determining whether the difficulty in changing behavioral strategies in different contexts is related to functional deficits and what psychological construct underlies this difficulty.

References

Agay, N., Kron, S., Carmel, Z., Mendlovic, S., & Levkovitz, Y. (2008). Ultimatum bargaining behavior of people affected by schizophrenia. *Psychiatry Research, 157*(1-3), 39-46.

Baas, D., Wout, M. V., Aleman, A., & Kahn, R. (2007). Social judgement in clinically stable patients with schizophrenia and healthy relatives: behavioural evidence of social brain dysfunction. *Psychological Medicine, 38*(05).

Barch, D. M. (2005). The relationships among cognition, motivation, and emotion in schizophrenia: How much and how little we know. *Schizophrenia Bulletin, 31*(4), 875-881.

Baumeister, R. F., Finkenauer, C., Vohs, K. D. (2001). Bad is stronger than good. *Review of General Psychology, 5*(4): 323–370.

Bechara, A., Damasio, A., Damasio, H., & Anderson, S. (1994). Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition*, 7-15.

Bell, M., Milstein, R., Beam-Goulet, J., Lysaker, P., & Cicchetti, D. (1992). The positive and negative syndrome scale and the brief psychiatric rating scale: Reliability, comparability, and predictive validity. *Journal of Nervous and Mental Disease, 180*(11), 723-728.

Campellone, T. R., Fisher, A. J., & Kring, A. M. (2016). Using social outcomes to inform decision-making in schizophrenia: Relationships with symptoms and functioning. Journal of *Abnormal Psychology, 125*(2), 310-321.

Cella, M., Dymond, S., Cooper, A., & Turnbull, O. (2012). Cognitive decision modelling of emotion-based learning impairment in schizophrenia: The role of awareness. *Psychiatry Research*, 15-19.

Conklin, H. (2002). Recognition memory for faces in schizophrenia patients and their first-degree relatives. *Neuropsychologia*, 2314-2324.

Couture, S. M., Penn, D. L., & Roberts, D. L. (2006). The Functional Significance of Social Cognition in Schizophrenia: A Review. *Schizophrenia Bulletin, 32*(Supplement 1).

Couture, S. M., Penn, D. L., Addington, J., Woods, S. W., & Perkins, D. O. (2008). Assessment of social judgments and complex mental states in the early phases of psychosis. *Schizophrenia Research, 100*(1-3), 237-241.

Curtis, G. J., & Locke, V. (2005). The effect of anxiety on impression formation: Affect-congruent or stereotypic biases? *British Journal of Social Psychology, 44*(1), 65-83.

Curtis, G. J., & Locke, V. (2007). Anxiety and impression formation: Direct information rather than priming explains affect-congruity. *Cognition & Emotion, 21*(7), 1455-1469.

Cropanzano, R., & Mitchell, M. (2005). Social Exchange Theory: An Interdisciplinary Review. *Journal of Management, 31*(6), 874-900.

Denrell, J. (2005). Why Most People Disapprove of Me: Experience Sampling in Impression Formation. *Psychological Review, 112*(4), 951-978.

Emerson, R M (1976). "Social Exchange Theory". *Annual Review of Sociology, 2*, 335–362.

Ermer, E., Guerin, S. A., Cosmides, L., Tooby, J., & Miller, M. B. (2006). Theory of mind broad and narrow: Reasoning about social exchange engages ToM areas, precautionary reasoning does not. *Social Neuroscience, 1*(3-4), 196-219.

Falk, A., & Fischbacher, U. (2006). A theory of reciprocity. *Games and Economic Behavior, 54*(2), 293-315.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical

power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175-191.

Fitch, K., Iwasaki, K., & Villa, K. (2014). Resource Utilization and Cost in a Commercially Insured Population with Schizophrenia. Retrieved December 9, 2015, from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4031739/

Fond, G., Bayard, S., Capdevielle, D., Del-Monte, J., Mimoun, N., Macgregor, A., . . . Raffard, S. (2013). A further evaluation of decision-making under risk and under ambiguity in schizophrenia. *European Archives of Psychiatry and Clinical Neuroscience, 263*(3), 249-257.

Gold, J. M., Waltz, J. A., Prentice, K. J., Morris, S. E., & Heerey, E. A. (2008). Reward Processing in Schizophrenia: A Deficit in the Representation of Value. *Schizophrenia Bulletin, 34*(5), 835-847.

Green, M. (2005). Social Cognition in Schizophrenia: Recommendations from the Measurement and Treatment Research to Improve Cognition in Schizophrenia New Approaches Conference. *Schizophrenia Bulletin*, 882-887.

Grusser O-J, Kirchoff N, Naumann A. (1990). Brain mechanisms for recognition of faces, facial expression, and gestures: neuropsychological and electroencephalographic studies in normals, brain-lesioned patients, and schizophrenics. *Research Publications Association for Research in Nervous and Mental Disease, 67*, 65–93.

Guth, W., Schmittberger, R., Schwarze, B., 1982. An experimental analysis of ultimatum bargaining. *Journal of Economic Behavior and Organization, 3*, 367–388.

Hamilton, D. L., Katz, L. B., & Leirer, V. O. (1980). Cognitive representation of personality

impressions: Organizational processes in first impression formation. *Journal of Personality and Social Psychology, 39*(6), 1050-1063.

Haut, K., & Macdonald, A. (2010). Persecutory delusions and the perception of trustworthiness in unfamiliar faces in schizophrenia. *Psychiatry Research*, 456-460.

Heerey, E. A., Bell-Warren, K. R., & Gold, J. M. (2008). Decision-Making Impairments in the Context of Intact Reward Sensitivity in Schizophrenia. *Biological Psychiatry, 64*(1), 62-69.

Hellewell JSE, Connell J, Deakin JFW. (1994). Affect judgment and facial recognition memory in schizophrenia. *Psychopathology, 27*, 255–61.

Hoe, M., Nakagami, E., Green, M., & Brekke, J. (2012). The causal relationships between neurocognition, social cognition and functional outcome over time in schizophrenia: A latent difference score approach. *Psychological Medicine*, 2287-2299.

Hooker, C., Tully, L., Verosky, S., Fisher, M., Holland, C., & Vinogradov, S. (2011). Can I trust you? Negative affective priming influences social judgments in schizophrenia. Journal of *Abnormal Psychology*, 98-107.

Impression formation, theories of. (2006). In J. Roeckelein (Ed.), *Elsevier's dictionary of psychological theories*. Oxford, United Kingdom: Elsevier Science & Technology. Retrieved from http://proxy.cc.uic.edu/login?url=http://search.credoreference.com/content/entry/estpsyctheory/impression_formation_theories_of/0.

Jalbrzikowski, M., Krasileva, K. E., Marvin, S., Zinberg, J., Andaya, A., Bachman, P., . . .

Bearden, C. E. (2013). Reciprocal social behavior in youths with psychotic illness and those at clinical high risk. *Development and Psychopathology, 25*(4.1), 1187-1197.

Kay, S. R., Flszbein, A., & Opfer, L. A. (1987). The positive and negative syndrome scale (PANSS) for schizophrenia. *Schizophrenia Bulletin, 13*(2), 261-276.

Kee, K., Green, M., Mintz, J., & Brekke, J. (2003). Is Emotion Processing a Predictor of Functional Outcome in Schizophrenia? *Schizophrenia Bulletin*, 487-497.

Koenigs, M., & Tranel, D. (2007). Irrational Economic Decision-Making after Ventromedial Prefrontal Damage: Evidence from the Ultimatum Game. *Journal of Neuroscience, 27*(4), 951-956.

Kohler, C., Walker, J., Martin, E., Healey, K., & Moberg, P. (2009). Facial Emotion Perception in Schizophrenia: A Meta-analytic Review. *Schizophrenia Bulletin*, 1009-1019.

Koenigs, M., & Tranel, D. (2007). Irrational Economic Decision-Making after Ventromedial Prefrontal Damage: Evidence from the Ultimatum Game. *Journal of Neuroscience, 27*(4), 951-956.

Kring, A. M., & Neale, J. M. (1996). Do schizophrenic patients show a disjunctive relationship among expressive, experiential, and psychophysiological components of emotion? *Journal of Abnormal Psychology*, *105*(2), 249-257.

Leakey, R. E., & Lewin, R. (1983). *People of the lake: mankind and its beginnings*. New York: Avon.

Lencucha, R., Kinsella, E. A., & Sumsion, T. (2008). The Formation and Maintenance of Social Relationships among Individuals Living with Schizophrenia. *American Journal of Psychiatric Rehabilitation, 11*(4), 330-355.

Leucht S, Kane JM, Kissling W, Hamann J, Etschel E, Engel RR (2005). What does the PANSS mean? *Schizophrenia Research, 79*, 231–238.

Ma, Correll, & Wittenbrink (2015). The Chicago Face Database: A Free Stimulus Set of Faces and Norming Data. *Behavior Research Methods, 47*, 1122-1135.

Martin, C. D., Baudouin, J., Franck, N., Guillaume, F., Guillem, F., Tiberghien, G., & Huron, C. (2011). Impairment not only in remembering but also in knowing previously seen faces and words in schizophrenia. *Psychiatry Research, 188*(1), 18-23.

Mattarozzi, K., Todorov, A., Marzocchi, M., Vicari, A., & Russo, P. M. (2015). Effects of Gender and Personality on First Impression. *PLOS ONE, 10*(9).

Pinkham, A., Hopfinger, J., Ruparel, K., & Penn, D. (2007). An Investigation of the Relationship Between Activation of a Social Cognitive Neural Network and Social Functioning. *Schizophrenia Bulletin*, 688-697.

Pligt, J. V., & Eiser, J. R. (1980). Negativity and descriptive extremity in impression formation. *European Journal of Social Psychology, 10*(4), 415-419.

Poole, J. H., Tobias, F. C., & Vinogradov, S. (2000). The functional relevance of affect recognition errors in schizophrenia. *Journal of the International Neuropsychological Society, 6*(6), 649-658.

Pridmore, S. (2012). Negative symptoms: Another differential. *Australasian Psychiatry, 20*(6), 527-528.

Sevy, S., Burdick, K., Visweswaraiah, H., Abdelmessih, S., Lukin, M., Yechiam, E., & Bechara, A. (2007). Iowa Gambling Task in schizophrenia: A review and new data in patients with schizophrenia and co-occurring cannabis use disorders. *Schizophrenia Research*, 74-84.

Shurman, B., Horan, W., & Nuechterlein, K. (2005). Schizophrenia patients demonstrate a distinctive pattern of decision-making impairment on the Iowa Gambling Task. *Schizophrenia Research*, 215-224.

Solomon, M., Olsen, E., Niendam, T., Ragland, J. D., Yoon, J., Minzenberg, M., & Carter, C. S. (2011). From lumping to splitting and back again: Atypical social and language development in individuals with clinical-high-risk for psychosis, first episode schizophrenia, and autism spectrum disorders. *Schizophrenia Research, 131*(1-3), 146-151.

Strauss, G. P., Frank, M. J., Waltz, J. A., Kasanova, Z., Herbener, E. S., & Gold, J. M. (2011). Deficits in positive reinforcement learning and uncertainty-driven exploration are associated with distinct aspects of negative symptoms in schizophrenia. *Biological Psychiatry, 69*(5), 424-431.

Tottenham, N., Tanaka, J. W., Leon, A. C., McCarry, T., Nurse, M., Hare, T. A., … Nelson, C. (2009). The NimStim set of facial expressions: Judgments from untrained research participantvonks. *Psychiatry Research, 168*(3), 242–249.

Turnbull, O., Evans, C., Kemish, K., Park, S., & Bowman, C. (2006). A novel set-shifting modification of the iowa gambling task: Flexible emotion-based learning in schizophrenia. *Neuropsychology*, 290-298.

Vakhrusheva, J., Zemon, V., Bar, M., Weiskopf, N., Tremeau, F., Petkova, E., . . . Butler, P. (2014). Forming first impressions of others in schizophrenia: Impairments in fast processing and in use of spatial frequency information. *Schizophrenia Research, 160*(1-3), 142-149.

Vonk, R. (1996). Negativity and potency effects in impression formation. *European Journal*

of Social Psychology, 26(6), 851-865.

Wilknson, G. S. (1993). WRAT-3. Wilmington, DE: WideRange, hc.

Wischniewski, J., Windmann, S., Juckel, G., & Brüne, M. (2009). Rules of social exchange: Game theory, individual differences and psychopathology. *Neuroscience & Biobehavioral Reviews, 33*(3), 305-313.

Wout, M. V., & Sanfey, A. G. (2011). Interactive decision-making in people with schizotypal traits: A game theory approach. *Psychiatry Research, 185*(1-2), 92-96.

Zhong, Y., & Yang, Z. (1998). A study of the priming effect of impression formation in social cognition: Frequency and recency effect. *Psychological Science, 21*, 425-428.

Table 1. *Demographic Descriptives.*

	Group		
	SCZ (*n* = 29)	CTRL (*n* = 28)	Test for differences
Age	47.93 (9.52)	44.07 (15.56)	***t* = -1.13 *p* = .27**
Education (years)	12.72 (3.01)	14.78 (2.61)	***t* = 2.72 *p* =.01**
Wide Range Achievement Test 3 Scaled Scores	91.79 (11.46)	99.41 (15.07)	***t* = 2.12 *p* = .04**
Gender			**X^2 = .02 *p* = .89**
Male	15 (52%)	15 (54%)	
Female	14 (48%)	13 (46%)	
Hispanic (ethnicity)			**X^2 = .13 *p* = .72**
Hispanic	4 (13.8%)	5 (17.9%)	
Not Hispanic	24 (82.7%)	23 (82.1%)	
Race			
White	3 (10.3%)	4 (14.3%)	**X^2 = .21 *p* = .65**
African American	22 (75.9%)	16 (57.1%)	**X^2 = 2.25 *p* = .13**
Hispanic	4 (13.8%)	3 (10.7%)	**X^2 = .13 *p* = .72**
Other	0 (0.0%)	5 (17.9%)	**X^2 = 5.68 *p* = .02**
Clinical Symptoms			
PANSS Positive Symptoms	16.39 (4.62)	--	
PANSS Negative Symptoms	17.54 (6.43)	--	
PANSS General Symptoms	32.43 (8.45)	--	
PANSS All Symptoms	66.36 (15.83)	--	

Table 2. *Fixed effects of mixed level model predicting amount of money made on the Character Assessment Gambling Task.*

Mixed Level Modeling	Estimate	S.E.	df	t	*p*	95% CI
Predicting overall money made from Diagnostic Group						
Intercept	173.07	10.79	56	16.05	<.001	151.46, 194.68
Diagnostic Group	-8.82	12.81	56	-.69	.49	-34.48, 16.84
Gender	3.23	12.30	56	.26	.79	-21.41, 27.88
WRAT-3 Scaled Scores	.97	.47	56	2.07	.04	.03, 1.91
Predicting money made across different partners with negative partner and healthy control as reference group						
Intercept	115.41	12.50	95.35	9.23	<.001	90.60, 140.22
Diagnostic Group	16.25	15.53	108.89	1.05	.30	-14.52, 47.02
Diagnostic Group*Positive Partner	-49.48	15.20	112	-3.26	.001	-79.59, -19.36
Diagnostic Group*Neutral Partner	-25.73	15.20	112	-1.69	.09	-55.85, 4.37
Positive Partner	118.84	10.93	112	10.87	<.001	97.18, 140.51
Neutral Partner	54.14	10.93	112	4.95	<.001	32.47, 75.81
Gender	3.23	12.30	56	.26	.79	-21.41, 27.88
WRAT-3 Scaled Scores	.97	.47	56	2.068	.043	.03, 1.91

Table 3. *Fixed effects of mixed level model predicting social evaluation ratings on CAGT by partner type.*

Mixed Level Modeling	Estimate	S.E.	df	t	*p*	95% CI
Predicting social evaluation ratings with neutral partner as reference group						
Intercept	6.28	.33	115.26	18.88	<.001	5.62, 6.94
Negative	-2.18	.34	112	-6.43	<.001	-2.86, -1.51
Positive	1.42	.34	112	4.17	<.001	.74, 2.09
Gender	-.32	.39	56	-.82	.42	-1.09, .46
WRAT-3 Scaled Scores	.02	.01	56	1.14	.26	-.01, .04

Table 4. *Fixed effects of mixed level model predicting social evaluation ratings on CAGT from diagnostic group and partner type.*

Mixed Level Modeling	Estimate	S.E.	df	t	*p*	95% CI
Predicting social evaluation ratings across all partners						
Intercept	6.27	.34	168	18.32	<.001	5.60, 6.95
Diagnostic group	-.48	.41	168	-1.19	.24	-1.29, .32
Gender	-.31	.39	168	-.80	.42	-1.08, .46
WRAT-3 scaled scores	.01	.01	168	.76	.45	-.02, .04
Predicting social evaluation ratings across different partners with negative partner and healthy controls as reference group						
Intercept	4.10	.44	133.76	9.43	<.001	3.24, 4.97
Diagnostic Group	-.02	.55	146.27	-.03	.98	-1.11, 1.08
Diagnostic Group*Positive Partner	-.17	.67	112	-.26	.80	-1.50, 1.15
Diagnostic Group*Neutral Partner	-1.22	.67	112	-1.82	.07	-2.54, .11
Positive Partner	3.69	.48	112	7.67	<.001	2.74, 4.65
Neutral Partner	2.81	.48	112	5.85	<.001	1.86, 3.77
Gender	-.31	.38	56	-.82	.42	-1.08, .45
WRAT-3 scaled scores	.01	.01	56	.78	.44	-.02, .04

Table 5. *Fixed effects of mixed level model predicting amount of gambled on the CAGT.*

Mixed Level Modeling	Estimate	S.E.	df	t	*p*	95% CI
Predicting overall money gambled from Diagnostic Group						
Intercept	169.87	10.75	56	15.81	<.001	148.34, 191.40
Diagnostic Group	-6.34	12.76	56	-.50	.62	-31.90, 19.23
Gender	3.40	12.26	56	.28	.78	-21.15, 27.96
WRAT-3 Scaled Scores	.94	.47	56	2.00	.05	-.003, 1.87
Predicting money made across different partners with negative partner and healthy control as reference group						
Intercept	142.08	11.99	84.31	11.85	<.001	118.23, 165.93
Diagnostic Group	18.64	14.75	94.61	1.26	.21	-10.65, 47.93
Diagnostic Group*Positive Partner	-47.44	12.81	112	-3.70	<.001	-72.83, -22.05
Diagnostic Group*Neutral Partner	-27.48	12.81	112	-2.15	.03	-52.87, -2.09
Positive Partner	55.89	9.22	112	6.07	<.001	37.62, 74.16
Neutral Partner	27.48	9.22	112	2.98	.004	9.21, 45.75
Gender	3.40	12.26	56	.28	.78	-21.15, 27.96
WRAT-3 Scaled Scores	.94	.47	56	2.00	.05	-.003, 1.87

Table 6. *Independent samples t-test comparisons of order one (neutral partner, negative partner, positive partner) and order two (neutral partner, positive partner, negative partner) in an undergraduate sample.*

	Group		
	Order 1 (*n* = 18)	Order 2 (*n* = 20)	Test for differences
Money made with neutral partner	118.13 (55.03)	121.94 (57.03)	***t* = -.21 *p* = .84**
Money gambled with neutral partner	117.67 (54.06)	121.70 (56.28)	***t* = -.23 *p* =.82**
Social evaluation of neutral partner	4.70 (1.12)	5.17 (1.87)	***t* = -.94 *p* = .36**
Money made with negative partner	64.24 (27.92)	66.04 (41.86)	***t* = -.16 *p* = .88**
Money gambled with negative partner	92.28 (38.70)	95.10 (58.04)	***t* = -.18 *p* = .86**
Social evaluation of negative partner	1.89 (1.19)	2.37 (1.43)	***t* = -1.12 *p* = .27**
Money made with positive partner	247.41 (47.01)	254.81 (68.39)	***t* = -.39 *p* = .70**
Money gambled with positive partner	188.00 (36.14)	194.90 (52.34)	***t* = -.48 *p* = .64**
Social evaluation of positive partner	8.09 (1.15)	7.55 (1.77)	***t* = 1.11 *p* = .28**

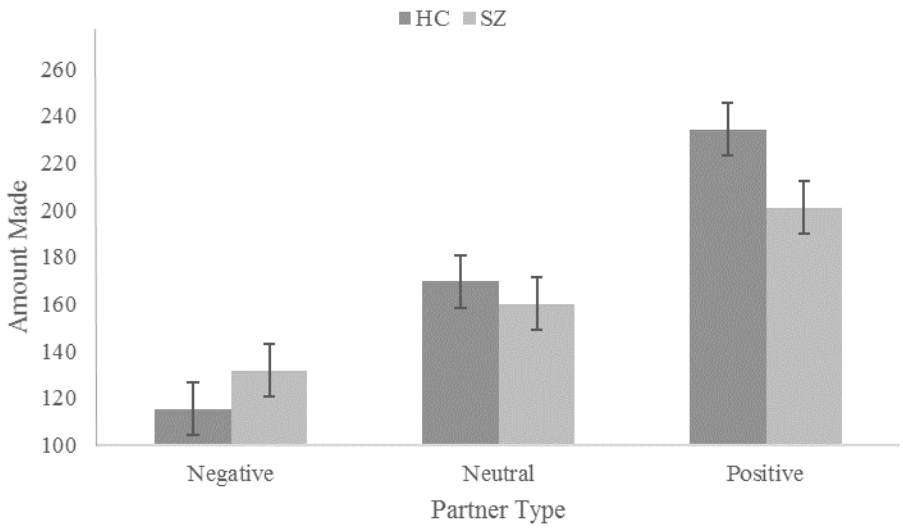

Figure 1. Average amount of money made with each partner on the Character Assessment Gambling Task (CAGT) for the Healthy Control Group (HC) and the Schizophrenia Group (SZ).

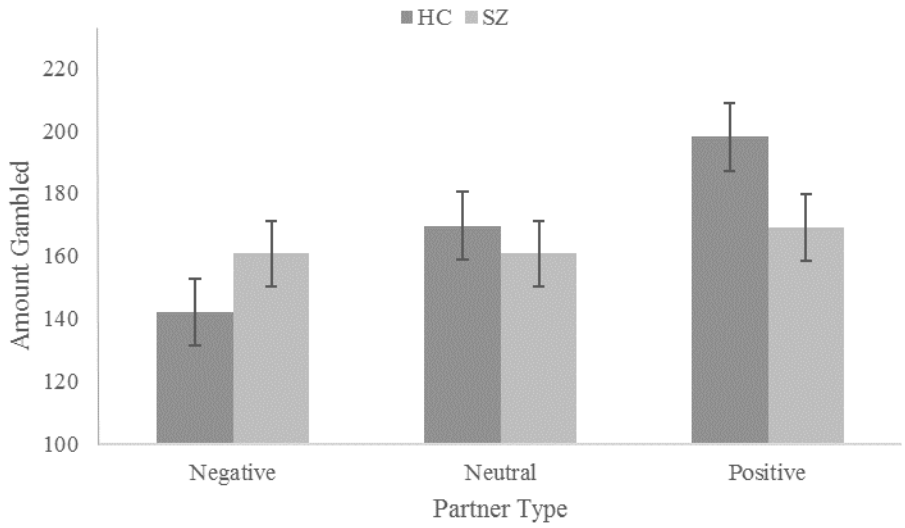

Figure 2. Average amount of money gambled with each partner on the Character Assessment Gambling Task (CAGT) for the Healthy Control Group (HC) and the Schizophrenia Group (SZ).

Curriculum Vitae

Colin M. Iwanski

HOME

2336 N Sacramento Ave Apt Garden B

Chicago, IL 60647

Telephone: (336) 509 1773

EDUCATION

B.A. University of North Carolina at Chapel Hill, Chapel Hill, NC. Graduated May 2011.

Major: Psychology Minor: Cognitive Science

PhD Student, University of Illinois at Chicago, Chicago, IL.

Major: Psychology Division: Clinical

PUBLICATIONS

Meyer, P., Johnson, D., Parks, A., **Iwanski, C.**, & Penn, D. (2012). *Positive living: A pilot study of group positive psychotherapy for people with schizophrenia*. The Journal of Positive Psychology, 7(3), 239-248.

Buck, B., **Iwanski, C**., Healey, K. M., Green, M. F., Horan, W. P., Kern, R. S., . . . Penn, D. L. (2017). *Improving measurement of attributional style in schizophrenia; A psychometric evaluation of the Ambiguous Intentions Hostility Questionnaire (AIHQ)*. Journal of Psychiatric Research, 89, 48-54.

ACADEMIC PRESENTATIONS

Iwanski, C., Keutmann, M., Rameshkumar, S., & Herbener, E. (2016, October). *Social judgments based on a series of encounters in healthy and schizophrenia participants.* Poster Session Presentation at the Society for Research in Psychopathology, Baltimore, MD

TEACHING EXPERIENCE

Introduction to Psychology	Fall 2015-Spring 2016
Abnormal Psychology	Fall 2016-Spring 2017
Psychological Interventions	Fall 2016
Laboratory in Clinical Psychology	Spring 2017
Guest Instructor at DePaul University for Sports Nutrition Course	May 25th, 2016
Guest Instructor at UIC for Psychological Interventions Course	October 26th, 2016
Guest Instructor at DePaul University for Sports Nutrition Course	May 15th, 2017

WORK EXPERIENCE

Graduate Research Assistant at Rush University Hospital and UIC. 2015-Present. Conducting psychodiagnostic and neuropsychological testing for individuals with schizophrenia and individuals at clinical high risk of developing a psychotic syndrome.

Assistant Study Coordinator at UNC-Chapel Hill Hospitals. 2014-2015. Scheduling and screening participants, database management, and study analysis for several ongoing oncological studies.

Study Coordinator at UNC-Chapel Hill in Department of Psychology. 2012-2014. Conducting study administrative needs, maintaining compliance with the Institutional Review Board of UNC-CH, database management, data analysis, and the writing of a research paper discussing the psychometrics of a measure of hostile social cognitive biases.