Effects of Social Isolation and Loneliness on Social Perception

By

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Thesis
Submitted to the Faculty of the
Graduate School of Vanderbilt University
in partial fulfillment of the requirements
for the degree of

MASTER OF ARTS
in

Psychology
August, 2015
Nashville, Tennessee

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ACKNOWLEDGEMENTS

Thank you very much to my advisor, Dr. Sohee Park for her guidance and support, for facilitating and fostering creative science, and her brilliant modeling of what it means to thrive as a woman in science. Thank you to Dr. Andrew Tomarken and Dr. Leslie Kirby for graciously serving on my thesis committee and for offering so much valuable personal and professional investment and insight for these projects. Thank you to my family, friends, and the members of the Park Clinical Neuroscience lab at Vanderbilt University for their support and encouragement.

This work would not have been possible without the financial support of the Vanderbilt University Department of Psychology, NICHD Grant P30 HD15052 and the Gertrude Conoway Endowment Fund.

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Introduction

Hallucinations and delusions are both core 'positive' symptoms of schizophrenia, present in about 70% of persons with a diagnosis of schizophrenia (Waters et al, 2012). Although etiology of these symptoms has not been determined, the socially charged nature of both hallucinations and delusions points to a potential etiology. Several hypotheses have been put forth as to the genesis of psychotic symptoms of schizophrenia. Amongst the most influential has been the dopamine hypothesis, emphasizing increased presynaptic striatal dopamine function in combination with prefrontal hypodopaminergia, giving way to aberrant salience (e.g., Howes & Kapur, 2009). However, this theory now acknowledges that complex environmental risk factors also play a central role (Lau et al, 2013). The social defeat theory, first put forth in 2005, posits that long term exposure to negative forms of exclusion from a majority group may lead to sensitization of the mesolimbic dopamine system, increasing risk for schizophrenia (Selten et. al, 2005). This is further supported by the observation that five of the major risk factors for schizophrenia include some form of social defeat as a common denominator (Selten et. al, 2013). Results from various animal studies provide robust support for the social defeat theory, but human studies have been scarce and inadequate to date. Nevertheless, these physiological and mechanistic hypotheses point to the importance of social factors in the etiology of schizophrenia. To address the potential neural mechanism underlying the origins of psychotic symptoms such as delusions and hallucinations, Ralph Hoffman developed the social deafferentation hypothesis (2007).

The Social Deafferentation Hypothesis (Hoffman, 2007) likens the phenomena of hallucinations to that of sensory deafferentation, such as in phantom limb syndrome as a result of amputation. Amputation often produces anomalous hallucinogenic experiences for the individual, as the brain attempts to compensate for the missing body part (Desmond & Maclachlan, 2010). Hoffman argues that analogous to the case of the phantom limb, high levels of social isolation may act as a psychological 'amputation' of the individual from necessary interaction with the social world, leading to a cortical reorganization of the social brain network. This social deprivation is thought to elicit a compensatory hyperactivity in the social brain network, leading to construction of spurious social meaning in the forms of delusion or hallucination. Thus, social withdrawal, a negative symptom of schizophrenia, may in fact cause, or further exacerbate positive symptoms. In fact, Hoffman reports that prior to the first onset of auditory hallucinations, 73% of respondents had experienced increased social isolation, for example, as a consequence of moving to a new neighborhood, a cross-country solo drive, or traveling alone to non-native language areas. These extreme forms of isolation may certainly lead to feelings of social defeat.

However, there is a wide range of individual responses to social isolation, and the subjective experience of social isolation may be more significant than the isolation itself. This difference between objective and subjective aspects of social isolation has been addressed by the cognitive discrepancy model put forth by Peplau & Perlman (1982), which conceptualizes the feeling of loneliness as the result of difference between perceived or experienced level of social involvement and one's desired amount of social involvement. Essentially, loneliness then is dissatisfaction with one's amount of social involvement, not necessarily a quantitative, but a qualitative lacking. Thus, experiencing loneliness would inherently imply that the individual had a desire for social interaction, and to a greater extent than what they currently experienced.

Mounting empirical evidence points towards the role of social isolation and loneliness in increasing the risk for psychosis. A retrospective study conducted by Tan & Ang (2001) demonstrated that the most robust prodromal discriminator of psychotic disorders was social isolation in a military population. A study examining the rate of conversion to psychosis from prodrome, by McGlashan et al. (2006), demonstrated that the threshold for detecting verbal meaning was reduced in individuals who later converted to schizophrenia. The assessment utilized dense phonetic information whereby only a few words could reliably be detected. The tendency to perceive distinct words or phrases within this babble was a robust predictor of future schizophrenia and was not better accounted for by other symptoms or neuropsychological impairment. Further, a study of Transcranial Magnetic Stimulation (TMS) over the occipital cortex in healthy participants demonstrated that after as little as one hour of visual deprivation, phosphenes were significantly more easily evoked by the procedure (Fierro et al., 2005). This result suggests that visual deprivation might cause marked cortical reorganization in as little as one hour. In fact, if blindfolding was sustained for a full day or more, complex visual hallucinations of faces and shapes were spontaneously evoked even in healthy participants (Merabet et al., 2004).

These findings summarized above provide some support for Hoffman's Social Deafferentation Hypothesis. However, to date, it has not been systematically tested. In the present study, we take initial steps to model and test the Social Deafferentation Hypothesis by examining the roles of loneliness and social exclusion in the accuracy of social meaning perception, in relation to schizotypal personality in healthy populations. We induce social exclusion or inclusion via a commonly used computerized ball-tossing game known as Cyberball (Williams & Jarvis, 2006) and present point-light animations of biological motion to determine endorsement of social movement detection at varying degrees of visual noise. We posit that perception of social stimuli will be impaired when participants are socially excluded, and that the persistent experience of loneliness may be associated with increased risk for psychosis, as well as reduced acuity in biological motion task performance.

Study 1: Effects of Social Manipulation on BM Performance in Healthy College-Aged Participants

Method

Participants

57 students were recruited from Vanderbilt University and randomly assigned to one of three social manipulation conditions: Exclusion, Neutral or Inclusion groups, each consisting of 19 participants. All participants reported normal or corrected to normal vision and no prior history of neurological disorder or prolonged drug use. Demographic data are displayed in Table 1. There were no significant differences in demographic data between the three groups. The protocol was approved by the Vanderbilt University Institutional Review Board. All participants gave written informed consent prior to testing and were compensated with credits towards fulfillment of a psychology course requirement. They were debriefed after the experiment about the social manipulation condition.

Procedure and Materials

Manipulation of social inclusion/exclusion using Cyberball

Participants were randomly assigned to the Exclusion, Neutral or Inclusion conditions. In the Exclusion and Inclusion conditions, participants first participated in Cyberball, an open-source virtual ball-tossing game that is widely used for research on ostracism, social exclusion or rejection. Cyberball has been shown to produce strong effects on mood, levels of belonging, selfesteem and meaningful existence, often with effect sizes ranging from 1.0-2.0 (Williams & Jarvis, 2006). The painful effects of ostracism have also been shown to be just as hurtful whether inflicted by in-group or out-group members, by strangers or acquaintances (Gonsalkorale & Williams, 2006, Williams, 2007). Thus, in our experiment, photos of one male and one female of commensurate age to participants were displayed as the two other “players” involved in the game with the participant.

Participants were told that this task was an exercise of their mental visualization skills and that they would be playing with two other randomly matched research participants who were logged in at the same time. Each time they received the ball, participants were supposed to pass the ball to whomever they chose, by clicking on the player’s photo. In reality, the two other ‘players’ were cyber-confederates. There were 100 ‘trials’ (ball tosses), which took about 10 minutes to complete on average.

In the Exclusion condition, participants received equal ball tosses from the other two players for the first six trials (33% pseudo-randomly generated) but after the 6^{th} trial, no ball was tossed to the participants for the duration of the experiment, thus reducing them to outsiders observing two others playing. In the Inclusion condition, participants received the ball equally for the duration of the task (33%, pseudo-randomly generated). Participants in the Neutral condition did not play Cyberball but completed a short paper and pencil questionnaire for ten minutes. Validity checks were administered post-experiment to ensure that all subjects were naïve to the Cyberball manipulation.

Biological Motion Detection Task

Immediately following the social manipulation, participants were asked to perform a computerized social perception task. This task included point-light animations first developed by Grossman and Blake (1999) by recording adult humans performing various common physical activities, including running, kicking, climbing, throwing and jumping. Markers were placed on the joints in each frame of the action sequence. These clips were subsequently imported and converted to matrices to be animated and manipulated in Matlab©. The present task randomly presented each of 25 animated stimuli to participants and asked them to judge the presence or absence of biological motion. Stimuli were displayed for 1s, after which participants would indicate with a key press (yes or no) whether the animation looked like human, biological motion or not. Based on their responses, stimuli were scrambled in a step-wise fashion, adding or removing noise from the motion to determine the threshold. Scrambled motion sequences were derived from their respective baseline biological animations and consisted of the same individual dots undergoing the same local motions as the biological counterparts, with increasingly randomized temporal and spatial properties for each dot. This results in a perturbation of the hierarchical, pendular motions that are characteristic of biological motion (Kim et al, 2005). Figure 1 depicts a pure biological motion trial as well as a trial with 25% noise added to the animation.

The threshold point for each participant on each animation was determined by a consistent oscillation between endorsing or rejecting biological motion in the stimuli for six consecutive trials. If a participant responded “Yes”, that the animation appeared to show biological motion, the next trial would display the same animation with a 1% increase in spatial scramble of point-light dots. If a participant responded “No”, that the animation did not display biological, human motion, the subsequent display would show the same motion with a 1% decrease in scramble. This process continued for each of the 25 animations until a participant's responses alternated between "Yes" and "No" for six consecutive trials, representing a threshold at which biological motion would be endorsed. Because the program was individualized to participant's responses, total trial numbers varied between participants. This final value of scramble percentage was then defined as the noise threshold for endorsing the presence of biological motion in each animation for each participant. Values were then averaged across the 25 stimuli to produce one global measure of threshold per participant. Reaction time was also measure for each decision point in the experiment and averaged per participant.

Figure 1. Point-Light BM Animation Sequence at Varying Degrees of Scramble

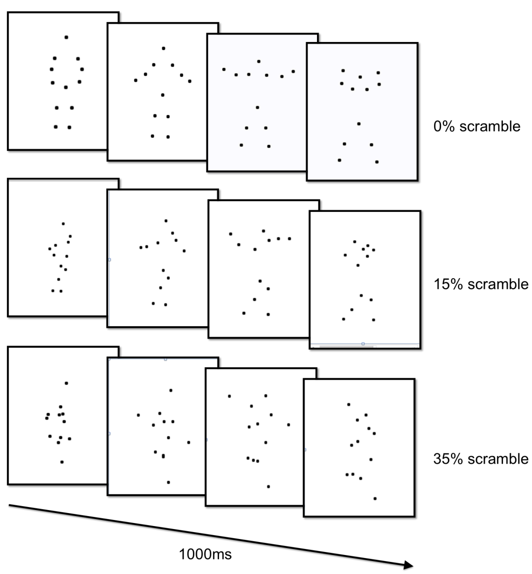


Fig. 1. Example of the stimuli used in the biological motion task. Frames show biological motion activity (jumping jack) from quasi-successive point-light animation sequences. At 0% scramble, the animation is preserved as pure biological motion. Successive scrambled animations contain the same dots undergoing the same local motions, but with spatiotemporal phase scrambling to generate noise within the biological motion displayed.

Self Report Questionnaires

The UCLA Loneliness Scale (Russell, Peplau, & Ferguson, 1978) was used to measure subjective feelings of loneliness and perceived social isolation. This measure is well established in the literature and found to be highly reliable, both in internal consistency (α ranging from 0.89 to 0.94) and test-retest reliability over a 1-year period (r=0.73) (Russell, 1996).

The Prodromal Questionnaire-Brief (PQ-B) was used to assesse the presence or absence of various attenuated psychotic symptoms (Ising et al., 2012). If a symptom is endorsed, the participant is asked to indicate the level of distress (PQ-B Distress) this symptom causes them, on a scale of 0 to 3.

There were no significant differences between manipulation groups on these measures of existing distress. Detailed descriptive statistics can be seen in Table 1.

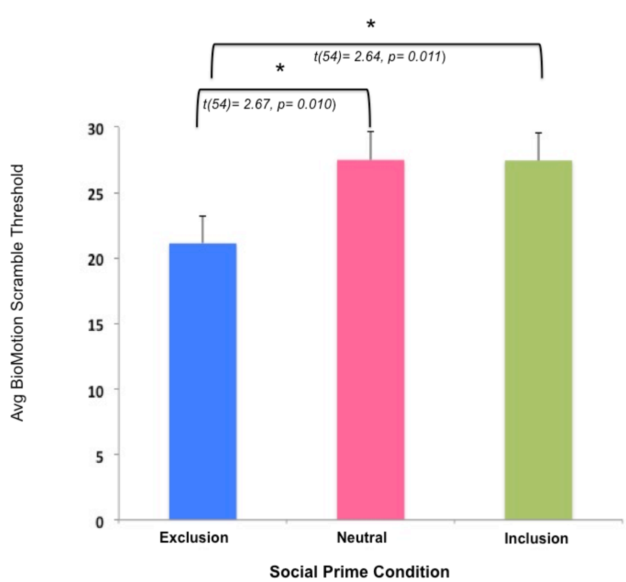
Table 1. HC Demographic Information and Self-report Data

	Exclusion (N=19)	Neutral (N=19)	Inclusion (N=19)
Age (years)	20.6 (2.1)	19.9 (1.2)	19.4 (2.5)
Sex	10M/9F	6M/13F	14M/5F
UCLA Loneliness	20.1 (11.9)	16.8 (11.5)	22.1 (10.1)
PQ-B	5.1 (3.6)	4.4 (3.1)	4.9 (4.5)
PQ-B Distress	1.1 (1.8)	0.57 (1.0)	1.6 (2.5)

Study 1 Results

Biological motion detection threshold was compared across the three groups. There was a main effect of group ($F(2,57)= 4.8$, $p < 0.01$). Further analysis showed that there was a significant difference between the Exclusion group and the Inclusion ($p = 0.0071$, $t = 2.82$), and between the Exclusion and Neutral groups ($t = 2.59$, $p = 0.0128$), but no significant difference between the Inclusion and Neutral groups ($p = 0.98$). See Figure 2.

Fig 2. Effects of Social Manipulation on Biological Motion Endorsement Thresholds



Increased endorsement of persistent loneliness was positively correlated with increased PQ-B ($r = 0.57$, $p < 0.0001$) and PQ-B Distress levels ($r = 0.56$, $p < 0.0001$) regardless of social manipulation. Loneliness was not associated with BM detection threshold ($r= -0.13$, $p = 0.386$). PQ-B Distress however, was negatively correlated with BM detection threshold ($r = - 0.29$, $p < 0.05$). See Table 2.

Table 2.

Correlations between BM, Loneliness and Measures of Prodromal Risk Across Subjects

	BM Threshold	Loneliness	PQ-B	PQ-B Distress
BM Threshold	1.00			
Loneliness	–0.13	1.00		
PQ-B	–0.21	0.57***	1.00	
PQ-B Distress	–0.29*	0.56***	0.63***	1.00

*p < .05 **p < .001 ***p < .0001

Within the Exclusion group, there was a trend toward a significant correlation between loneliness and PQ-B Distress (r= 0.48, p = .07). In the Neutral group, there was a positive correlation between Loneliness and higher PQ-B scores (*r* = 0.77, p < 0.001) and a trend toward significant correlation between loneliness and PQ-B Distress (r=0.45, p = .09). In the Inclusion group, there were positive correlations between PQ-B and Loneliness ratings (*r* = 0.53, p < 0.01), between PQ-B Distress and Loneliness (*r* = 0.61, p < 0.005), and between reaction time (ms) and Loneliness (*r* = 0.52, p < 0.05). Tables 3.A-C present these group-specific findings.

Tables 3.A,B,C

Correlations between BM, Loneliness and Measures of Prodromal Risk By Group

A. Exclusion					
	BM Threshold	BM RT	Loneliness	PQ-B	PQ-B Distress
BM Threshold	1.00	1.00			
Loneliness	–0.25	0.28	1.00		
PQ-B	–0.23	–0.007	0.29	1.00	
PQ-B Distress	–0.31	–0.30	0.48	0.61*	1.00

B. Neutral					
	BM Threshold	BM RT	Loneliness	PQ-B	PQ-B Distress
BM Threshold	1.00	1.00			
Loneliness	0.05	–0.10	1.00		
PQ-B	–0.12	0.18	0.77**	1.00	
PQ-B Distress	–0.22	–0.22	0.45	0.33	1.00

C. Inclusion					
	BM Threshold	BM RT	Loneliness	PQ-B	PQ-B Distress
BM Threshold	1.00	1.00			
Loneliness	0.004	0.52*	1.00		
PQ-B	–0.12	0.27	0.53*	1.00	
PQ-B Distress	–0.34	0.37	0.61**	0.76***	1.00

*p < .05 **p < .001 ***p < .0001

Discussion

Results from Study 1 indicate that an acute social isolation manipulation can significantly alter one's perception of social information. The Exclusion group showed significantly less accurate perception of BM than did the Neutral or Inclusion groups, which did not differ from each other. This suggests that social deafferentation via isolation and exclusion may be a potential mechanism by which social perception is detrimentally altered. Higher endorsement of feelings of loneliness, the distress manifested by desire for more social interaction than acquired, was strongly associated with risk for psychosis across our sample, though not significant between groups. This would perhaps indicate that a more stable, pervasive trait such as loneliness might contribute more significantly to psychosis-risk than an acute manipulation of social isolation. This is supported by the observed relationship between distress level regarding prodromal symptoms and reduced perceptual acuity in the biological motion task, but not between biological motion detection and overall endorsement of prodromal symptoms. It would appear from this preliminary investigation that distress is the crucial feature linking these factors.

Interestingly, higher levels of loneliness were associated with slower reaction times in the Inclusion group. This finding indicates that loneliness may impair not only social perception but contribute to a slowing of processing speed for social stimuli as well. Indeed, prior research into social exclusion has demonstrated similar deficits on timed cognitive task performance, with effects found to be specific to social exclusion scenarios rather than broadly the result of hearing bad news (Baumeister et al., 2002). One potential mechanism for this occurrence may be that exclusion from social groups sets off emotional distress that preoccupies the self-regulation system and reduces resources for executive control processes, producing a short-term impairment of cognitive functioning. Over time, and with chronic exposure, this reduction of resources due to social distress may result in a more pervasive slowing in processing speed, as well as hindrance of global prefrontal functioning. As individuals with schizophrenia are also consistently reported to have impairment in cognitive processes such as working memory (e.g. Forbes et al., 2009), this may be an additional area for further exploration.

Limitations

This preliminary exploration of the social deafferentation hypothesis was conducted in college undergraduates, a group with inherently rich social interaction potential. Despite this, an acute manipulation of social experience was able to significantly alter social perceptual judgments. Nonetheless, averaged endorsement of prodromal risk factors and social distress were relatively low, suggesting that the influence of these more stable and chronic factors may not have been as prominent or easy to detect. These results also would not be representative of less socially ensconced individuals, and thus should not be extrapolated to many individuals with active psychosis or schizophrenia. We may expect a dampening of the salience of an acute manipulation in a population with more chronic social exclusion and loneliness. These relationships will be explored in Study 2, involving SZ patient participants.

In addition, our Biological Motion task was designed to discover a threshold value for detection of biological motion within scramble noise. However, note that all stimuli contained some amount of biological motion, as there were no 'pure' scrambled noise trials. Thus, social information was never truly absent in this experiment. A new experiment that includes 100% noise trials (i.e. no biological motion present) is currently in progress, to examine whether those at elevated risk for psychosis falsely detect social meaning in true random noise. While the results of this study indicated that an acute manipulation of social isolation could result in altered biological motion perception, it is not possible to determine whether true accuracy of social detection was compromised. Finally, this study included a measure of loneliness but no measure of objective social contact, and thus we were unable to parse apart the distinct contributions of social distress from social isolation. We thus implemented a quantification measure of social interaction for Study 2, as is subsequently discussed, in order to determine the relative impacts of each.

Study 2: Effects of Social Manipulation on BM Performance in Individuals with Schizophrenia.

Method

Participants

18 medicated outpatients with schizophrenia (SZ) have been recruited thus far from private care facilities in Nashville, TN. Diagnoses were confirmed with the structured clinical

interview for DSM-IV (SCID; First et al., 2002). Exclusion criteria included intelligence (IQ) < 85, a prior history of head injury or neurological disorder or history of drug use in the year prior to the study. Premorbid IQ was estimated using the North American Adult Reading Test (NAART; Uttl, 2002). All participants had normal or corrected-to-normal vision. Participants gave written informed consent as approved by the Vanderbilt Institutional Review Board.

The Vanderbilt University Institutional Review Board again approved this protocol. All participants gave written informed consent prior to testing and were compensated at a rate of $20 per hour. Participants were debriefed carefully after the experiment about the social manipulation and purpose of the study.

Procedure and Materials

Manipulation of social inclusion/exclusion using Cyberball

Participants were randomly assigned to participate in the Exclusion, Neutral or Inclusion conditions as used in Study 1. All methods and materials of the Cyberball manipulation portion of the experiment were identical to those in Study 1 (see above for details). Validity checks were again administered post-experiment to ensure that all subjects were naïve to the Cyberball manipulation at the time of testing.

Clinical Ratings and Self Report Questionnaires

Symptoms were assessed using the Brief Psychotic Rating Scale (BPRS, Overall & Gorham, 1978), the Scale for the Assessment Positive Symptoms (SAPS; Andreasen, 1984b) and the Scale for the Assessment Negative Symptoms (SANS; Andreasen, 1984a). The BPRS is a widely used clinical interview rating scale consisting of 24 items used to measure psychiatric symptoms such as hallucinations, grandiosity, blunted affect and bizarre behavior. Each symptom is rated 1-7 by the clinicians conducting the interview. The SAPS is a rating scale that focuses specifically and exclusively on the positive symptoms that may or may not be experienced by an individual. This scale includes measures of hallucinations, delusions, bizarre behavior and thought disorder. The SANS measures negative symptoms, including ratings of symptoms under the domains of affective flattening, alogia (poverty related to speech), avolition-apathy and anhedonia-asociality. Symptom interviews were conducted by trained lab members in pairs and scored independently before cross-validating to ensure authentic and accurate symptom ratings.

The UCLA Loneliness Scale (Russell, Peplau, & Ferguson, 1978) was again used to measure subjective feelings of loneliness. Social interaction type and quantity were also measured through a list of various social situations (school, work, religious or other shared-interest activity, at home interaction, etc.). The participant was asked to indicate whether or not they had engaged in each type within the past month, and to estimate the frequency with which they had been engaged for each endorsed item within the month.

Biological Motion Detection Task

Immediately following the social manipulation, participants were asked to perform a computerized social perception task. This task included the same point-light animations displayed in Study 1. Participants were again randomly presented each of the 25 animated stimuli asked to judge the presence or absence of biological motion. However, in this task, unlike in Study 1, values of scramble were set to be 0% (e.g. completely pure biological motion, no noise introduced), 25% or 100% (purely noise trials). Each noise level was used on 50 trials randomly, for a total of 150 task trials overall. The introduction of pure biological motion trials as well as 100% noise trials allowed the task to serve as a sensitivity index, as it was possible in this task to identify hit and false-alarm rates. This signal detection efficiency was then calculated per participant as a d-prime (d') value. This statistic measures the separation between the means of the signal and the noise distributions, compared against the standard deviation of the noise distribution. An estimate of d' can also found from measurements of the hit rate and false-alarm rate. It is calculated as: $d' = Z(\text{hit rate}) - Z(\text{false alarm rate})$, (MacMillan & Creelman, 2004). In other words, higher d' values indicate that a signal, in this case, biological motion, is detected more efficiently and accurately by the participant amongst the occluding noise present, or higher scrambling of the point lights in motion.

Collapsing of Data

There are no significant differences in demographic or clinical data between the three manipulation groups. Due to lack of power and sample size (current $n = 6$ per condition), between group analyses have not yet been possible. Demographics are reported collapsed across current groups and present analyses investigate individual differences in performance on BM tasks as related to symptom and distress measures for Study 2. Detailed demographic and clinical information can be seen in Table 3.

Table 3.

SZ Participants Demographic and Clinical Data

	SZ
Age (years)	45.4 (7.9)
Sex	11M/7F
NAART (IQ)	101.7 (9.84)
UCLA Loneliness	23.7 (18.1)
BPRS	21.2 (12.4)
SAPS	19.7 (15.8)
SANS	38.0 (19.9)

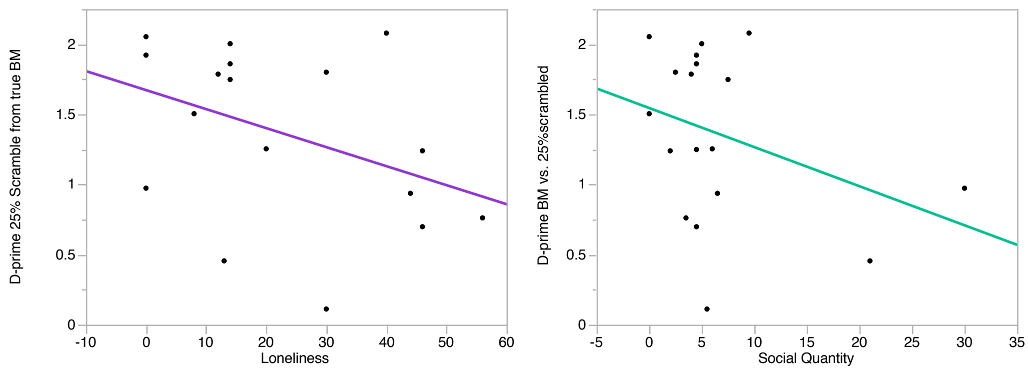
Study 2 Results

As stated, at present biological motion performance is not compared across the three manipulation groups due to insubstantial sample size. Preliminary findings collapsed across conditions demonstrate a trending negative relationship between BM perceptual response and reported loneliness (r = -0.40, p = 0.09). The more loneliness endorsed, the less accurate (lower *d'* value) obtained during the BM task, on average. However, this relationship was not found between reported social interaction quantity and *d'*. Pure social quantity and accuracy on the BM task showed no trending relationship (r = -0.27, p = 0.28). See Figure 3.

Figs 3.A, B.

Relationships Between BM Accuracy and Loneliness vs. BM Accuracy and Pure Social Quantity in Individuals with Schizophrenia

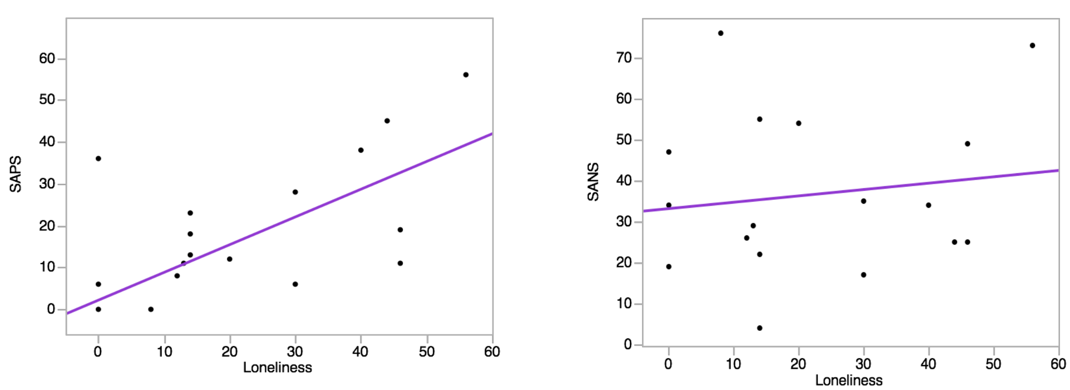
A. Loneliness and *D'* B. Social Quantity and *D'*



Increased endorsement of persistent loneliness was positively correlated with increased positive symptom ratings (SAPS, $r = 0.56$, p = 0.01), but not negative symptom ratings (SANS, $r = 0.07$, p = 0.76) across subjects. See Figure 4. There were no significant findings of any relationship found between BM *d'* and symptoms ratings in the present analyses (SAPS, $r = -0.28$, p = 0.20, SANS, $r = -0.13$, p = 0.55).

Figs 4.A, B. Relationships Between SAPS and Loneliness vs. SANS and Loneliness in Individuals with Schizophrenia

A. SAPS and Loneliness B. SANS and Loneliness



Discussion

Preliminary results from Study 2 indicate no current effect of acute social isolation manipulation on perception of social information in individuals with schizophrenia. Individual differences were seen in more chronic, stable traits such as global loneliness. It may be that individuals with schizophrenia are less pervious to acute social manipulations, numbed to small, swift changes given the typical intensity of social isolation of their everyday life. Importantly, loneliness was associated with both BM task performance and psychotic symptoms ratings, while social isolation in itself did not. This suggests a key component of distress in the influence of social exclusion, above and beyond the damage of isolation itself.

Similar to findings in Study 1 of healthy college-aged participants, higher endorsement of loneliness was associated with presence and intensity of positive symptoms of psychosis. Interestingly, negative symptoms were not found to be related to loneliness, suggesting a unique relationship between positive symptoms, where social stimulation and meaning are fabricated, and feelings of loneliness, lending some further support to the social deafferentation model of a relationship between the two. The direction of this relationship is not examined in the present study, though future efforts to determine potential mediation models should be pursued.

Limitations

As stated, this investigation currently lacks adequate sample size to make any firm conclusions about social manipulation effects between condition groups in individuals with schizophrenia. In addition, participants in the present study all exhibit chronic, medicated and managed illness, and results are not representative of a population with more florid psychosis. Indeed, throughout the trajectory of schizophrenia, positive syndrome tends to dissipate while negative symptoms prevail. This is the case in our group of participants, who are older adults and have relatively low reports of positive syndrome to test our hypotheses upon. Lastly, it is unclear whether the present social manipulation of the Cyberball game is salient enough to produce effects in a population much more used to social neglect, on average. It may be the case that a more intensive manipulation would be necessary to produce testable effects on social perception. As expected, we see a potential dampening of the salience of an acute manipulation in a population with more chronic social exclusion and loneliness.

Conclusions

We sought to examine and empirically test Hoffman's social deafferentation hypothesis in regards to the fabrication of aberrant social meaning in randomness. Findings in healthy indicate that loneliness is indeed strongly associated with higher risk for psychosis and higher distress regarding symptoms of prodromal psychosis. This suggests that social exclusion may lead to a wide range of abnormal experiences including perceptual errors, not just emotional problems. Thus, loneliness and isolation (i.e., reduction of social stimulation in general) may reduce one's ability to detect social information when it is in fact present.

We found that in healthy college-aged participants, an acute social manipulation via Cyberball reduced subsequent detection of biological motion. Indeed, even just ten minutes of social isolation could influence perception and speed of social information processing. Moreover, social distress (loneliness) and symptomatic distress (PQ-B Distress) seemed to be important for the relationship between social isolation and social perception.

We next sought to investigate these phenomena in a more socially isolated and vulnerable population, to determine the relationship of acute versus chronic social isolation and loneliness, as well as their contributions to abnormal social information processing. Recruitment is ongoing, but preliminary results suggest a unique contribution of distress via loneliness, over and above social isolation to positive symptomatology and social perceptual acuity, as well as strong associations generally between positive symptomatology and loneliness, but not between negative symptoms and loneliness.

We continue to recruit participants for Study 2 and next seek to corroborate these data by examining the relationships between loneliness and analyses of specific lexical patterns in first-person-accounts (illness narratives) of individuals with schizophrenia. Future efforts will include novel treatment intervention research to examine potential social distress remediation pathways while attempting to alleviate positive syndrome in individuals with schizophrenia.

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