European Archives of Psychiatry and Clinical Neuroscience
https://doi.org/10.1007/s00406-024-01777-0

ORIGINAL PAPER

The impact of the COVID-19 pandemic on perceptions of social relationships, negative affect, and paranoid ideation

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Received: 20 September 2023 / Accepted: 2 February 2024

Abstract

The COVID-19 pandemic contributed to worsening mental health across the globe. The pandemic may have been especially impactful on those experiencing heightened psychosis spectrum symptomatology given greater pre-pandemic social isolation and increased vulnerability to stress. Yet, few studies exploring the impact of the COVID-19 pandemic on perceptions of social relationships and mental health have sampled individuals high in psychosis spectrum symptomatology, including those with psychosis spectrum disorders. Utilizing a mixed transdiagnostic community sample enriched for psychotic spectrum disorders, this longitudinal study investigated whether perceptions of social relationships and psychiatric symptoms changed during the COVID-19 pandemic, whether pandemic-related impacts were associated with social perceptions and symptomatology, and whether paranoid ideation was related to perceptions of the government response to the COVID-19 pandemic. Pandemic impacts were not uniform, with participants reporting a range of adverse impacts including poorer health-related behaviors, difficulties fulfilling basic needs, and medical related challenges. Results indicated that compared to pre-pandemic assessments, perceived rejection and hostility increased during the COVID-19 pandemic. Participants who experienced more pandemic-related impacts reported less social support, more social distress, greater negative affect, and greater paranoid ideation. Paranoid ideation was related to more negative perceptions of the government's response to the pandemic. These findings demonstrate the importance of assessing individual differences in pandemic-related impacts and the clinical consequences of such impacts. Results also suggest that those high in paranoid ideation may be reluctant to engage in government recommended protective health behaviors to limit the spread of COVID-19.

Keywords Paranoia · Psychosis · Coronavirus · Depression · Anxiety · Social perception

Introduction

The COVID-19 pandemic contributed to significant life disruption, stress, and increased mental health concerns. In the general population, psychological distress and negative affect increased [1–4]. Additionally, COVID-related fear contributed to psychosis-spectrum symptomatology [5, 6]. Despite multiple studies that demonstrate the psychological toll of the pandemic, fewer studies have included individuals with heightened psychosis-spectrum symptomatology.

Because of already diminished social contact, individuals high on the psychosis spectrum, including both clinical and community members, may have been more vulnerable to the negative effects of increased social isolation that occurred during the first year of the COVID-19 pandemic. Before the pandemic, those with psychosis spectrum disorders spent more time alone compared to controls [7] and had smaller social network size related to more severe symptoms [8]. Additionally, in the general population fewer social contacts and greater loneliness predicted increases in psychotic-like experiences [9]. During the early pandemic, psychotic-like symptoms in the general population were greater for those who were more socially isolated [10] and these symptoms increased during stay-at-home orders [11]. Also, inpatients with psychosis spectrum disorders who were isolated due to close contact with COVID-19 reported greater stress, depression, and anxiety compared to inpatients who did not isolate [12]. These findings support a connection between

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Published online: 13 March 2024

social isolation during the pandemic and psychiatric symptomatology across the full psychosis spectrum.

Increased stress caused by the COVID-19 pandemic may also have promoted psychosis-spectrum symptomatology. Elevated emotional reactivity to stress is present in those vulnerable to developing psychosis spectrum disorders and increased stress precedes increases in psychotic symptoms [13]. For those with psychosis spectrum disorders, heightened stress reactivity is related to and predicts increased negative affect [13, 14]. Also, those living with psychosis spectrum disorders experience more negative emotions and fewer positive emotions compared to controls [15]. Thus, individuals higher in psychosis-spectrum symptomatology may be more vulnerable to the pandemic-related increases in negative affect observed in the general population [4]. Increased negative affect may be especially problematic given its impact on paranoid ideation.

Increases in negative affect have been theorized to contribute to the inaccurate interpretation of external events as threatening, leading to paranoid ideation [16]. Research demonstrates that increases in negative affect can lead to greater paranoid ideation in both clinical and community samples [17–20] and the relationship between stress and psychotic experiences is mediated by negative affect [21]. Thus, increases in negative mood during the pandemic [1–4] could contribute to greater paranoid ideation.

The potential for the COVID-19 pandemic to increase paranoid ideation is concerning given its association with greater social impairment and decreased quality of life in both clinical and non-clinical samples [22, 23] and a poorer prognosis in individuals with clinical psychosis [23]. Paranoid ideation may also affect compliance with behaviors designed to limit the spread of COVID-19. Evidence suggests that psychosis-spectrum symptomatology, including paranoid ideation, contributes to the development of COVID-related conspiratorial thinking [24]. In the general population, greater levels of conspiracy beliefs are related to less adherence to government guidelines designed to reduce the spread of COVID-19 [25, 26] and individuals high in paranoid thinking are less likely to engage in protective health behaviors [27]. Additionally, individuals with severe mental illness (SMI) who refuse vaccination exhibit greater paranoid ideation than those who become vaccinated [28]. Taken together, these findings suggest that individuals with high levels of interpersonal mistrust may be less willing to engage in protective health behaviors.

Although the COVID-19 pandemic may be especially salient for those experiencing elevated psychotic symptoms, only a handful of studies examining the impact of the pandemic on perceptions of social relationships and symptomatology have included individuals with psychosis spectrum disorders. In Veterans with psychosis, researchers found an increase in negative affect and loneliness and a small decrease in social network size [29]. However, at follow-up later during the pandemic, negative affect decreased [29]. This contradicts other findings that negative affect worsened during the first six months of the pandemic for people with psychosis [30] and that anxiety increased over the course of COVID-related lockdowns in individuals with SMI, including those with psychosis [28]. Pinkham et al. [31] found no change in mood or psychotic symptoms during the pandemic in a mixed clinical sample that included individuals with psychosis. Berglund et al. [32] partially replicated this by finding no change in hallucination or delusion frequency during the pandemic, though they did find symptom-related distress increased during lockdown and decreased following lockdown. Strauss et al. [33] demonstrated that negative symptoms worsened during the COVID-19 pandemic for individuals with psychosis and that reduced opportunities for social engagement did not fully explain this change. Finally, a pilot study in individuals with psychosis found that social functioning worsened, loneliness increased, and social contact outside of the home decreased, though there were small increases in video contact with others [34].

Thus, there is some evidence that the COVID-19 pandemic contributed to worse symptoms and poorer social engagement among individuals with psychosis. However, this literature has several limitations, including using retrospective recall, failing to assess paranoid ideation using comprehensive measures (e.g., using single item measures), and not directly measuring perceptions of social support. Additionally, only a single study exploring the impact of the pandemic on psychosis-spectrum symptomatology directly assessed for the role of COVID-related experiences on symptoms with Berglund et al. [32] examining the role of medication adherence and telehealth engagement of symptomatology during the pandemic. Even then, this study did not assess the impact of negative COVID-related experiences on symptoms. This is an important limitation since there is variability in stress-related experiences during the pandemic spanning social, financial, and health domains [35, 36].

The current study sought to better understand the impact of the COVID-19 pandemic on perceptions of social relationships, negative affect, and paranoid ideation. To ensure a broad spectrum of social functioning and symptomatology was captured, we capitalized on existing pre-pandemic data collected using a dimensional sampling strategy focused on a mixed transdiagnostic community sample enriched for psychotic disorders. This approach is consistent with both the National Institute of Mental Health's Research Domain Criteria (RDoC; [37, 38]) initiative and the Hierarchical Taxonomy of Psychopathology (HiTOP; [39]). This strategy also aligns with findings that psychosis-spectrum symptomatology is evident in non-clinical samples [40] and that such

symptoms can be associated with COVID-related beliefs and behaviors in the general population [24–27, 41].

The current longitudinal study seeks to determine the impact of the COVID-19 pandemic on relationships and psychiatric symptomatology. Specifically, we hypothesized:

(1) Compared to the pre-pandemic baseline, participants would report lower levels of social support and higher levels of social distress during the pandemic
(2) Compared to baseline, participants would report increased paranoid ideation during the pandemic
(3) Participants who experience more negative COVID-related experiences would report lower levels of social support, greater levels of social distress, greater negative affect, and greater paranoid ideation
(4) Participants with greater paranoid ideation during the pandemic would report more negative appraisals of the government's response to the pandemic.

Method

Participants

Participants ($N = 55$) were recruited from a transdiagnostic sample of individuals with and without psychosis who participated in a larger NIH-funded project [42, 43] prior to the pandemic. The current sample included 39 participants (71%) with a psychotic disorder and 16 control participants (29%) without any history of psychosis. Clinical participants were recruited from outpatient mental health clinics in the Washington DC-Baltimore metropolitan area while controls were recruited from the same area using online advertisements. All previous participants ($N = 120$) in the larger NIH study were eligible for the current study. Potential participants were contacted via mail and phone and all respondents interested in the current study were enrolled. Of the 120 potential participants, 26 did not respond to calls or letters, 8 agreed to complete the survey online (see procedures below) but never completed it, 6 were deemed ineligible due to lack of email address, 1 was determined to be ineligible due to an inability to provide consent, 7 refused due to concerns about compensation, 3 refused due to not having time to participate, and 14 refused without providing a reason. A $40 electronic gift-card was offered as compensation for the time spent completing this study. Procedures were approved by the University of Maryland, Baltimore Institutional Review Board and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

Pre-pandemic baseline data were drawn from the parent study. Participants provided information about their experiences during the COVID-19 pandemic by completing surveys between October 2020 and February 2021. In the state of Maryland (USA), this period coincided with a second surge in cases and hospitalizations along with state-mandated social distancing and mask requirements. The average daily social indexing score (the extent to which residents and visitors practice social distancing) in Maryland during this period was 40.14 ($SD = 8.69$, Range: 25–71*)* while the average daily percentage of people staying at home in Maryland during this period was 23.03% ($SD = 2.84\%$, Range: 22.83%-33.26%*)* [44]. Additionally, vaccines were not available to any participants during data collection [45].

For the parent study, inclusion criteria for clinical participants included (1) aged 18–60, (2) lifetime history of psychotic disorder or mood disorder with psychotic features, (3) clinical stability (i.e., no inpatient hospitalizations for 3 months before enrollment, no changes in psychiatric medication four weeks before enrollment), (4) English fluency, and (5) normal or corrected-to-normal vision. Inclusion criteria for control participants included (1) aged 18–60, (2) no current psychiatric disorder or psychiatric medications, (3) no lifetime history of psychotic or mood disorder, (4) English fluency, and (5) normal or corrected-to-normal vision. Exclusion criteria for all participants included (1) moderate or severe substance use disorder in the past 6 months or mild substance use disorder in the past month, (2) lifetime neurological, cognitive, or developmental disorder, (3) history of serious head injury, (4) MRI contraindications, and (5) unwillingness to have study assessments videotaped. For the present study, exclusion criteria also included (6) no access to an email address. This final exclusion criterion was necessary as remote payment could only be provided via email.

Procedures

Baseline measures were collected during an in-person assessment for the parent study. For data collected during the COVID-19 pandemic, participants completed self-report surveys via phone or internet. Participants who completed surveys online ($N = 24$) were emailed a personalized Qualtrics survey link. Participants who completed the survey via phone ($N = 29$) were asked each item by trained research staff who entered responses into Qualtrics in real time. One participant began the survey via phone and completed the rest online. The average time between the two assessments was 769.78 days ($SD = 302.21$, Range: 269–1310) an inter-assessment duration similar to other studies exploring the effects of the pandemic on psychosis-spectrum symptomatology [33].

Measures

Diagnostic and clinical assessment

To confirm psychiatric diagnoses, the mood and psychotic disorder modules of the Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (SCID-5; [46]) were administered to all clinical participants. Control participants completed a SCID-5 screener and relevant SCID-5 modules to confirm eligibility. All participants completed SCID-5 modules during the baseline assessment.

The Revised Green Paranoid Thoughts Scales (R-GPTS; [47]) was used to assess paranoid ideation. The R-GPTS is an 18-item self-report measure of paranoid thinking over the past month. The original GPTS [48] is considered the most valid and psychometrically sound self-report measure for paranoid ideation [49], but was recently revised to improve its precision [47].

The Brief Psychiatric Rating Scale (BPRS; [50]) is a 24-item clinical interview designed to assess psychiatric symptoms over the last week. Using previously established factors [51], the Depression-Anxiety score was used to assess for baseline negative affect. The BPRS was not administered during the pandemic due to concerns about its validity in a remote context.

To assess for negative affect during the pandemic, the National Institutes of Health Patient-Reported Outcomes Measurement Information System (PROMIS) Depression and Anxiety short form scales [52] were used. The Depression scale is an 8-item questionnaire that inquires about depression symptoms experienced over the past week. The Anxiety scale is a 7-item questionnaire that inquires about common anxiety symptoms experienced over the past week. Both short forms perform as well as legacy measures and place less burden on participants [52–54].

Social perceptions

The Adult Social Relationships Scale (ASRS; [55]) consists of six self-report scales assessing perceptions of social support and social distress. Perceived social support is assessed with subscales for instrumental support, emotional support, and friendship, while perceived social distress is assessed with subscales for loneliness, perceived rejection, and perceived hostility. Each subscale has demonstrated good internal reliability and concurrent validity with other self-report scales [55].

Impact of the pandemic

The Social Psychological Measurements of COVID-19: Coronavirus Perceived Threat, Government Response, Impacts, and Experiences Questionnaire Short Form (SPMC; [56]) measures perceptions of government response to the pandemic. Items from the Government Restriction and Government Punishment subscales were used to create a Positive Perceptions of Government (PPG) scale. The Government Reactance and Government Information Contamination subscales were used to create a Negative Perceptions of Government (NPG) scale. Both the PPG and NPG were created specifically for the current study and demonstrated acceptable internal reliability ($\alpha = 0.78$ and $\alpha = 0.71$, respectively).

To capture the number of adverse events experienced because of the COVID-19 pandemic, the Epidemic-Pandemic Impacts Inventory (EPII; [57]) was used. The EPII asks participants to indicate whether they experienced various life changes over the entire course of the COVID-19 pandemic. Participants respond to statements about potential pandemic-related impacts such as *"Unable to pay important bills like rent or utilities"* and *"Less physical activity or exercise"* with *Yes, No,* or *N/A*. There are no psychometric properties available for this scale and no optimal scoring procedures have yet been created. In the current study, the number of *Yes* responses were totaled to create a count score. This approach is consistent with other studies exploring the mental health impacts of the COVID-19 pandemic [58–60]. In the current study, specific items were selected from the Economic, Emotional Health and Wellbeing, and Physical Health Problem subscales.

Data analytic plan

All analyses were completed using R statistical software version 4.0.2 [61]. Prior to analysis, descriptive statistics for demographics and negative COVID-related experiences were calculated. Also, a series of chi-squared and t-tests was conducted to examine demographic and symptom differences between the current sample ($N = 55$) and non-participants from the parent study ($N = 65$). Next, paired-sample t-tests were conducted to examine changes in social support, social distress, and paranoid ideation from baseline to levels during the pandemic. Due to skewness in paranoid ideation at both timepoints, bootstrapping analyses with 10,000 samples were conducted to compare paranoid ideation between timepoints. Finally, zero-order correlations were conducted to explore the relation between negative COVID-related experiences and both social perceptions and symptoms along with the relation between paranoid ideation and perceptions of the government response to the pandemic. Follow-up partial correlations were conducted for significant relations detected between COVID-related experiences and both social perceptions and symptoms to determine whether relations remained when accounting for pre-pandemic levels of social perceptions and symptoms.

Results

Demographic characteristics of the sample are provided in Table 1. Chi-squared tests conducted to examine differences between the current sample and non-participants from the parent study revealed a significantly greater proportion of control participants in the current study ($\chi^2 = 6.58$, $p = 0.01$). Control participants comprise 29% of the current sample compared to 18% of non-participants from the parent study. Additionally, t-tests revealed significant differences in income ($t = 3.17$, $p = 0.002$) and education ($t = 3.10$, $p = 0.002$) between those who participated in the current study and those who did not. Specifically, participants in the current study had a larger average income ($M = 19{,}116.62$) and more years of education ($M = 13.69$) compared to non-participants (income: $M = 8686.72$; education: $M = 12.35$). There were no other demographic differences and no differences in symptoms or perceptions of social relationships between the two groups. Additional analyses were also conducted to examine if there were any differences between participants in the current sample based on the method of data collection (online or via phone). These analyses found no differences between the two groups for any of the variables of interest ($ps > 0.05$).

Descriptive statistics for all baseline and COVID-19 pandemic assessments are summarized in Table 2. Frequencies for adverse COVID-related events are summarized in Table 3. These data indicate impacts of the pandemic on health-related behaviors, difficulties fulfilling basic needs, and medical related challenges. No participants had been diagnosed with COVID-19 by the time of data collection and only 8 (14.5%) reported having been in close contact with someone who tested positive for COVID-19.

When examining changes in social support and distress, results indicated greater levels of perceived rejection ($t = 2.56$, $p = 0.01$) and perceived hostility ($t = 2.46$, $p = 0.02$) during the COVID-19 pandemic compared to baseline.

Table 1 Sample Characteristics

	Mean (*SD*) or *n* (%)
Age (years)	46.78 (12.16)
Sex	32 (58.2%)
Male	23 (41.8%)
Female	
Race	32 (58.2%)
Black/African American	16 (29.1%)
White	3 (5.5%)
Asian	3 (5.5%)
More than one race	1 (1.8%)
Not Reported	
Ethnicity	49 (89.1%)
Non-Hispanic or Latino	5 (9.1%)
Hispanic or Latino	1 (1.8%)
Not reported	
Education (years)	13.44 (2.31)
Diagnosis	11 (20.0%)
Schizophrenia	7 (12.7%)
Schizoaffective bipolar type	7 (12.7%)
Schizoaffective depressive type	8 (14.5%)
Bipolar I w/psychotic features	6 (10.9%)
MDD w/psychotic features	16 (29.1%)
No diagnosis (control)	

Table 2 Descriptive statistics for assessments and *T* test results

Measure	Pre-COVID			COVID	*t*	*p*
	M		*SD*	*M*	SD	
ASRS emotional support	32.38	7.26	30.80	7.70	− 1.13	.27
ASRS instrumental support	26.06	8.62	26.09	9.72	.02	.99
ASRS friendship	25.61	7.93	24.35	8.37	− 1.20	.24
ASRS loneliness	11.00	5.27	13.17	5.89	1.95	.06
ASRS perceived rejection	14.36	7.09	17.87	7.45	2.56	.01
ASRS perceived hostility	13.65	6.07	16.45	5.77	2.46	.02
R-GPTS total[a]	10.92	14.27	12.23	14.54	–	–
BPRS depression-anxiety	8.27	4.12	–	–	–	–
PROMIS depression	–	–	16.45	7.81	–	–
PROMIS anxiety	–	–	16.83	7.99	–	–
SPMC positive perceptions of government	–	–	9.86	3.14	–	–
SPMC negative perceptions of government	–	–	7.33	3.17	–	–
EPII count score	–	–	2.31	1.85	–	–

ASRS Adult Social Relationships Scale, *R-GPTS* Revised Green Paranoid Thoughts Scale, *PROMIS* Patient-Reported Outcomes Measurement Information System, *BPRS* Brief Psychiatric Rating Scale, *SPMC* Social Psychological Measurements of COVID-19, *EPII* Epidemic-Pandemic Impacts Inventory

[a] *t* and *p* values for R-GPTS Total are not listed due to the use of bootstrapping to make this calculation

Table 3 EPII COVID-19 impacts

	Yes count (%)
More time sitting down or being sedentary	36 (65.5%)
Less physical activity or exercise	27 (49.1%)
Overeating or eating more unhealthy foods	21 (38.2%)
Difficulty getting places due to less access to public transportation or safety concerns	13 (23.6%)
Unable to get enough or healthy food	12 (21.8%)
Increase in health problems not related to COVID-19	10 (18.2%)
Unable to access mental health treatment	8 (14.5%)
Unable to pay important bills	8 (14.5%)
Unable to get needed medications	6 (10.9%)
Unable to access clean water	1 (1.8%)

These findings remained significant when controlling for the inter-assessment duration (Rejection: $t = 2.50$, $p = 0.01$; Hostility: $t = 2.44$, $p = 0.02$). There were no significant differences in scores for emotional support, instrumental support, friendship, or loneliness. These analyses are summarized in Table 2. These findings indicate that perceived rejection and hostility increased during the pandemic.

Regarding our second hypothesis, analyses revealed no difference between R-GPTS scores between the two timepoints 95% CI [− 3.548, 6.03]. Thus, paranoid ideation did not increase during the pandemic.

Regarding our third hypothesis, nonparametric correlational analyses indicated that the number of negative COVID-related experiences was related to less emotional support ($r = -0.36$, $p = 0.01$) and instrumental support ($r = -0.35$, $p = 0.01$) and greater loneliness ($r = 0.27$, $p = 0.05$), perceived rejection ($r = 0.32$, $p = 0.02$), and perceived hostility ($r = 0.38$, $p = 0.01$). The number of negative COVID-related experiences was not significantly related to perceptions of friendship ($r = -0.26$, $p = 0.06$). Analyses also indicated that experiencing more negative COVID-related events was associated with greater paranoid ideation ($r = 0.42$, $p < 0.01$), depression ($r = 0.38$, $p < 0.01$), and anxiety ($r = 0.49$, $p < 0.001$). Thus, more negative COVID-related experiences were related to less social support, more social distress, and worse symptoms. When accounting for pre-pandemic levels of social perceptions and symptoms, all significant correlations remained significant ($ps < 0.05$) except the relation between COVID-related experiences and loneliness ($r = 0.17$, $p = 0.22$).

Our final hypothesis was also tested using bootstrapping analyses with 10,000 samples. There was no significant relation between paranoid ideation and positive perceptions of government, 95% CI [− 0.27, 0.13]. However, there was a significant positive relation between paranoid ideation and negative perceptions of government, 95% CI [0.01, 0.45]. This indicates that paranoid ideation was associated with more negative perceptions of the government's response to the COVID-19 pandemic.

Discussion

Given preexisting risk factors, the COVID-19 pandemic may have been especially deleterious to those with heightened psychosis-spectrum symptomatology. The present study sought to provide additional insight into how the pandemic has impacted interpersonal relationships and psychiatric symptomatology.

Within a transdiagnostic sample with and without psychosis, perceived social rejection and perceived hostility by others during the pandemic were greater compared to pre-pandemic levels. Participants perceived that people in their life were both more neglectful of them and their problems and more critical or openly hostile compared to before the pandemic. However, there were no changes in loneliness compared to pre-pandemic levels, contradicting previous findings [34]. Contrary to our hypothesis, there was no change in social support during the pandemic compared to baseline, contradicting evidence from research in psychosis, which suggests that the pandemic contributed to less social engagement [29, 34]. However, evidence from other clinical populations and the general population suggests that social relationships were maintained during periods of social distancing [62–64]. Thus, participants experienced increases in social distress while simultaneously maintaining levels of social support during the pandemic.

Findings indicated no change in paranoid ideation from pre-pandemic levels, replicating previous null findings [31, 32]. However, since perceived rejection and perceived hostility increased from baseline, this finding is somewhat surprising as social distress and paranoid ideation are related [65]. Although paranoid ideation did not change over time, individual perceptions of others did, suggesting a subtler impact of the pandemic on perceptions of hostile intent.

When exploring negative COVID-related impacts, descriptive data indicated significant impacts across several domains, including pandemic-related impacts on health-related behaviors. The deleterious impact of the pandemic on health-related behavior is notable given the existing medical comorbidities and vulnerabilities to severe illness and death from COVID-19 in psychosis [66–69]. These results suggest the need to not only assess social and mental health consequences of the COVID-19 pandemic across the psychosis spectrum, but to also assess changes in health-related behaviors and the implications for managing medical comorbidities.

Regarding the relation between pandemic-related impacts and social perceptions and psychiatric symptomatology, analyses indicated that the experience of more

COVID-related impacts was related to lower levels of social support, and greater social distress, negative affect, and paranoid ideation, with nearly all relations remaining significant when controlling for pre-pandemic levels of social perceptions and symptoms. These findings indicate that individual differences in COVID-related impacts relate to greater symptomatology and erosions in perceptions of social relationships during the pandemic. This partially replicates research from the general population which finds a relation between negative COVID-related events and negative affect [59]. These findings also add to the current understanding of how the COVID-19 pandemic has affected those with psychosis spectrum disorders as we are not aware of any research that has directly assessed for specific individual-level COVID-related impacts or has examined the relation between such impacts and social perceptions or symptoms. While the pandemic has impacted daily life for many, these findings demonstrate that these experiences are not uniform for individuals across the psychosis spectrum and that assessing individual differences in COVID-related impacts is vital to understanding how the pandemic affects social perceptions and mental health.

Our findings also demonstrated a relation between more severe paranoid ideation during the pandemic and negative perceptions of the government's response to the pandemic. These findings build upon research from the general population which found a relation between greater interpersonal mistrust and less adherence to protective behaviors aimed at reducing the spread of COVID-19 [24–27]. Our finding raises concerns that those high in paranoid ideation may be less willing to engage in behaviors that protect them against COVID-19, especially if these behaviors are recommended or mandated by the government. Indeed, more recent evidence suggests that individuals with SMI who refuse to be vaccinated have greater levels of paranoid ideation compared to those who are vaccinated [28]. Understanding the relation between paranoid ideation and protective health behaviors is crucial as those with psychosis spectrum disorders are at increased risk for serious illness and death from COVID-19 [66, 70–72]. Unique interventions may be required to educate and engage individuals high in paranoid ideation on the importance of protective health behaviors.

While these findings are informative, there are several limitations. First, our moderate sample size precluded examination of the potential role of diagnostic categories, including the lack of a formal diagnosis, on the current findings. Additionally, while we sought to take a dimensional approach in this study, our recruitment strategy prioritized a community sample enriched for psychotic disorders and we may not have captured individuals at all levels of symptom severity or functional impairment. Second, analyses demonstrated a recruitment bias which suggests that the current sample may have been more high functioning than non-participants from the parent study, similar to other work in psychosis conducted during the pandemic [33]. However, it is important to note that there were no differences in symptoms or social perceptions between the two groups. Third, the long inter-assessment duration limited our ability to measure potential confounding factors occurring between the two assessment points, though this duration is similar to other studies exploring the effects of the pandemic on psychosis-spectrum symptomatology [33]. Fourth, while the current study explored questions about social support and engagement, socially relevant negative symptoms [73] were not measured and we did not directly assess who participants spent time with and the quality of social contact. Additionally, we did not directly measure the extent to which social distancing and government-mandated lockdowns may have contributed to participants' social engagement. Finally, while our finding regarding the relation between paranoid ideation and negative perceptions of the government's response to the pandemic is informative, the current study did not measure compliance with protective health behaviors.

In summary, these findings show that levels of social distress increased during the pandemic along the psychosis spectrum. More pandemic-related impacts were associated with poorer social support, greater social distress, and worse symptoms during the pandemic. Current findings also highlight the relation between paranoid ideation and negative perceptions of the government's response to the pandemic. These findings have implications for our understanding of how the COVID-19 pandemic can impact individuals with psychosis spectrum symptomatology and how these impacts affect social perceptions and symptoms. Additionally, these findings illustrate how paranoid ideation may create barriers to engaging in protective health behaviors, especially if these behaviors are recommended or mandated by the government. This knowledge gained during the COVID-19 pandemic could be used to support preparation or intervention planning for future health emergencies.

Author contributions RD.O: methodology, formal analysis, investigation, data curation, writing- original draft, project administration. CL.G.S: investigation, data curation, writing—review and editing. ME.B: Funding acquisition, conceptualization, methodology, writing—review and editing, supervision, project administration. JJ.B: funding acquisition, conceptualization, methodology, writing—review and editing, supervision, project administration.

Funding This work was supported by the National Institute of Mental Health (grant number R01-MH110462).

Data availability Deidentified data can be made available upon reasonable request to the primary author at rorth@umd.edu.

Declarations

Conflict of Interest The authors declare that they have no conflict of interest.

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