1   Investigating predictors contributing to the expression of schizotypy during the COVID-19 pandemic

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Abstract

18 The coronavirus (COVID-19) pandemic has caused major disruptions to social and other forms of

19 functioning, which may influence schizotypy expression. The current study aimed to explore possible

20 distal and proximal predictors contributing to schizotypy in a sample of the Australian general population

21 during the COVID-19 pandemic. The COvid-19 and you: mentaL heaLth in AusTralia now survEy

22 (COLLATE) project is an online mental health study aimed at tracking key mental health indicators over

23 the progression of the pandemic. Adults residing in Australia were invited to take part using non-

24 discriminative snowball sampling. Demographic-clinical information was collected for 850 participants in

25 either October 2020 or January 2021. To assess schizotypy facets, the Launay-Slade Hallucinations Scale-

26 Extended (LSHS-E) and Peters Delusions Inventory (PDI-21) were used to measure hallucination and

27 delusion proneness respectively. Generalised linear models (with gamma and negative binomial

28 distributions) were employed. Age, negative emotions and loneliness significantly contributed to both

29 hallucination and delusion proneness; gender, education and religiosity also significantly contributed to

30 delusion proneness, in the final regression models. Our study corroborated the specific contribution of

31 loneliness, amongst other factors, in the prediction of schizotypy facets. Tackling loneliness represents a

32 public health challenge that needs to be urgently addressed, especially in the face of the ongoing COVID-

33 19 pandemic.

34

35 **Keywords:** Hallucinations; delusions; population mental health; predictors; schizotypal experiences

36

1. Introduction

Schizotypy is a group of personality traits that manifest as experiences resembling the signs and symptoms of schizophrenia, only these experiences tend to be less severe and have less impact upon emotional, social and occupational functioning (Baumeister et al., 2017; de Leede-Smith and Barkus, 2013; van Os et al., 2009). Nevertheless, schizotypal experiences are often found to coalesce within multiple dimensions that also resemble the syndromes of schizophrenia (van Os et al., 2009), such as a positive dimension encompassing hallucination- and delusion-like experiences, a negative dimension encompassing anhedonia and social withdrawal, and a disorganised dimension encompassing odd speech and eccentric behaviour (Vollema and van den Bosch, 1995).

According to dimensional models of psychopathology, individuals who express high levels of schizotypy are more prone to developing schizophrenia and share many of the same risk factors for the disorder (Meehl, 1962; van Os et al., 2009). For example, they are more likely to have a first-degree relative with schizophrenia, be exposed to the same environmental risk factors (e.g. urban upbringing, traumatic childhood, etc.), and demonstrate cognitive impairments that are analogous, but milder, to those seen in schizophrenia (Barrantes-Vidal et al., 2015; Binbay et al., 2012; Morton et al., 2017; van Os et al., 2009). In addition, like schizophrenia, high schizotypy is associated with mood dysregulation, cannabis abuse, being single or divorced, and being in a lower socioeconomic bracket (Binbay et al., 2012).

Although biological and environmental risk factors are often emphasised, some researchers have stressed the added importance of social functioning in the development and maintenance of schizophrenia . For instance, links between the schizotypy-schizophrenia continuum and social isolation have been reported (Gayer-Anderson and Morgan, 2013; Le et al., 2019; Michalska da Rocha et al., 2018; Narita et al., 2020), and these associations encompass elevated loneliness (i.e. the subjective experience of being disconnected from others; Michalska da Rocha et al., 2018), as well as smaller, more distant social networks and less frequent social contact (i.e. objective social isolation; Gayer-Anderson and Morgan, 2013). Social contact may provide opportunities for normalizing explanations of anomalous experiences, and so social isolation has been hypothesised to facilitate and maintain the presence of positive symptoms, particularly delusions (Garety et al., 2001). Loneliness is also thought to encourage the perception of

64 threat and the development of negative affect (Eglit et al., 2018). Indeed, several studies have reported

65 specific relationships between delusions or delusion-like experiences of suspiciousness, and both social

66 isolation (Myin-Germeys et al., 2001; Sorenson et al., 2021) and loneliness (Jaya et al., 2016; Narita et al.,

67 2020; Sorenson et al., 2021; Sundermann et al., 2014). Moreover, the associations with loneliness appear

68 to be mediated by levels of negative affect (Jaya et al., 2016; Sundermann et al., 2014).Given the

69 influences of various environmental risk factors and social functioning upon the expression of schizotypy,

70 the occurrence of major societal crises might be expected to coincide with widespread increases in

71 schizotypal experiences. One such crisis, the coronavirus (COVID-19) pandemic, has caused major life

72 disruptions, either directly as a result of the disease itself or indirectly via societal restrictions imposed by

73 governments to contain its spread. In Australia, these restrictions have included strict lockdown measures

74 and curfews, social distancing and the implementation of density limits, quarantining, transitioning

75 education to remote learning, and working from home (Department of Health, 2020; see also: O'Sullivan

76 et al., 2020). In turn, there have been numerous detrimental secondary effects, such as job losses, financial

77 instability, relationship conflicts, domestic violence and xenophobia, all of which have potentially

78 contributed to an increase in loneliness and social isolation (Boxall et al., 2020; Furlong and Finnie, 2020;

79 O'Sullivan et al., 2020; Smith and Lim, 2020; Usher et al., 2020).

80   Accordingly, emerging research from other countries is beginning to indicate that the pandemic

81 may be contributing to increased schizotypy expression (Alle and Berntsen, 2021; Bortolon et al., 2021;

82 Fekih-Romdhane et al., 2021; Knolle et al., 2021; Strauss et al., 2021). For instance, Knolle et al. (2021)

83 surveyed the mental health impact of the COVID-19 pandemic during May 2020, recruiting samples of the

84 general population from the UK and Germany when the two countries were still within their initial

85 lockdown periods. Using the Schizotypal Personality Questionnaire (SPQ; Raine, 1991), they found that

86 schizotypy scores were increased in people who were concerned about life stability, who had a greater

87 financial burden, who had poorer pre-existing physical and mental health, and those who had not

88 transitioned to working from home. A second survey conducted by the same research group in October

89 2020, when most restrictions had eased, revealed that schizotypy levels were again elevated in people with

90 poorer physical health, as well as in people with increased financial burden and loneliness (Daimer et al.,

91 2021). Other surveys conducted during the initial lockdowns in France (Bortolon et al., 2021) and the

92 USA (Alle and Berntsen, 2021), as well as at the end of lockdown restrictions in Tunisia (Fekih-

93 Romdhane et al., 2021), all showed somewhat similar findings, suggesting that negative affect (Bortolon

94 et al., 2021; Fekih-Romdhane et al., 2021), maladaptive coping (Bortolon et al., 2021; Fekih-Romdhane et

95 al., 2021), loneliness (Bortolon et al., 2021) and social isolation (Alle and Berntsen, 2021; Fekih-

96 Romdhane et al., 2021) significantly predicted schizotypal experiences during the COVID-19 pandemic.

97 Although the aforementioned findings are consistent with a COVID-19-related exacerbation of

98 schizotypy, the replicability of these findings and their generalisability to Australia is not yet clear.

99 Australia has been relatively successful in containing the spread of COVID-19, and mitigated the number

100 of infections and deaths, but its population has had to endure some of the strictest social isolation

101 measures in the world (described earlier). As such, it provides an excellent context for investigating

102 associations between loneliness and social isolation, and schizotypy. Furthermore, there is currently very

103 little information regarding whether some pandemic-related disruptions are associated with particular

104 schizotypy dimensions, or whether they implicate schizotypy globally. Only Knolle et al. (2021) and

105 Bortolon et al. (2021) have investigated individual schizotypy dimensions separately, and they reported

106 evidence of dimension-specific relationships. For instance, Bortolon et al. (2021) found that the frequency

107 of experiencing paranoia during lockdown was predicted by a different set of variables to those that

108 predicted the frequency of experiencing hallucinations. This difference included loneliness, which

109 predicted paranoia but not hallucinations.

110 Therefore, the aim of the current study was to investigate whether self-reported life disruptions

111 during COVID-19 were associated with hallucination- and delusion-like experiences in an Australian

112 general population sample. Our research question focused on exploring whether proximal changes in

113 employment, financial status, work location, negative emotions, social contact and loneliness are

114 significantly associated with hallucination- and delusion-like experiences, while controlling for existing

115 distal factors (i.e. age, gender, education, religiosity, living situation, and pre-existing physical and mental

116 health) that are known to influence the expression of these schizotypy facets. Based on previous findings,

117 we expected to find that more self-reported financial and employment disruptions (including not being

118 able to work from home), social isolation and loneliness , and negative emotions would all be significantly

119   associated with more experiences of schizotypal hallucinations and delusions during the COVID-19

120   pandemic, after accounting for the effects of the aforementioned distal influences.

121   **2. Methods**

122   *2.1 Participants and procedures*

123   The COvid-19 and you: mentaL heaLth in AusTralia now survEy (COLLATE) project was

124   launched on 1 April 2020, as a nationwide study aimed at tracking the mental health of Australians amidst

125   the COVID-19 pandemic. This project has been described elsewhere (Rossell et al., 2021; Tan et al.,

126   2020) but in brief, comprises 13 online surveys, activated for 72 hours at the start of each month, followed

127   by a series of follow-up surveys over the next four years. Members of the general public residing in

128   Australia, aged 18 years or older, were invited to complete the survey via social media advertising and

129   other online networks, participant registries held by Swinburne University of Technology as well as non-

130   discriminative snowball sampling stemming from these initial recruitment methods. Past respondents were

131   encouraged to participate in each new round of surveys, but new respondents who had not previously

132   taken part were also accepted. This serial cross-sectional design permitted timely snapshots across

133   multiple points to gain a broad understanding of population mental health as the COVID-19 situation

134   evolved.

135   The current study utilised data collected in October 2020 and January 2021, as questions about

136   hallucination- and delusion-like experiences, and loneliness were asked in these two months. This was

137   based on a pre-determined survey design, which involved a brief core battery of key survey questions,

138   alongside a secondary list of questionnaires that were inserted/removed in line with a regular rotation

139   schedule. All January 2021 participants as well as unique October 2020 participants (who did not respond

140   to January survey) were retained. This was done because the January response rate was lower, and we

141   wanted to match sample sizes for the two time points as much as possible, whilst ensuring each participant

142   was included only once. To provide additional context around these time points, Victoria was coming

143   towards the end of a strict ~16-week lockdown in October 2020 (~18,000 cases were recorded during this

144   second wave of infections), with the rest of Australia generally free from COVID-19; most of Australia

145   was in a similar state of stability, with negligible COVID-19 cases in January 2021, except for a small

146   pocket of New South Wales which was experiencing a minor outbreak of infections (<150 cases). The

147   study received ethics approval from the Swinburne University Human Research Ethics Committee

148   (#20202917-4107), and complied with the Declaration of Helsinki. Respondents provided online informed

149   consent, and collected responses were anonymous.

150   *2.2 Measures*

151   Two broad areas were examined: i) sociodemographic information, and ii) mental health status.

152   Basic sociodemographic information was collected, including: age, gender, education, religiosity,

153   employment status (whether adversely impacted by COVID-19) and work location (whether working from

154   home), living situation (whether residing alone or with others), household income in the past fortnight,

155   reduction in social contact owing to COVID-19 (in terms of number of hours), as well as whether

156   respondents had a pre-existing physical/medical condition (*yes/no*), and/or were a person with lived

157   experience of a mental illness (*yes/no*). The response categories for each of these sociodemographic

158   variables are presented in Table A (supplementary section).

159   Mental health status was assessed further using several measures. Negative emotions were evaluated using

160   the Depression Anxiety Stress Scales (DASS-21), a 21-item self-report measure, rated on four-point Likert

161   scales (0-3), comprising three subscales: depression, anxiety, stress (Lovibond and Lovibond, 1995).

162   Loneliness was gauged by the abbreviated University of California, Los Angeles Loneliness Scale

163   (UCLA-LS), comprising two positively worded and two negatively worded items, rated on four-point

164   Likert scales (1-4; Russell et al., 1980). Hallucination and delusion proneness were assessed using the

165   Launay-Slade Hallucinations Scale-Extended (LSHS-E) and Peters Delusions Inventory (PDI-21)

166   respectively. The LSHS-E is a 16-item measure, rated on five-point Likert scales (0-4), assessing

167   multisensory hallucinatory experiences in the general population, with higher summed scores indicating

168   increased hallucination proneness (Vellante et al., 2012). The PDI is a 21-item multidimensional measure

169   of the propensity for delusional thinking based on atypical beliefs or vivid mental experiences, tapping

170   into themes involving reference, persecution, grandiosity, religion-supernatural, mind-reading, control,

171   jealousy, sin-guilt, somatic, thought alienation and nihilism (Peters et al., 2004). Questions describe

172   unusual thinking styles or mental events, and require a *yes/no* answer (dimensional *distress*, *preoccupation*

173 and *conviction* ratings were not collected in the current study). Each *yes* answer is allocated a score of 1,

174 with higher summed scores indicating increased delusion proneness.

175 *2.3 Data analysis*

176   Statistical analyses were conducted using IBM SPSS Statistics, version 27. To contextualise our

177 results, we first reported pertinent demographic and clinical information relevant to our sample, and

178 compared our mean hallucination and delusion proneness scores with those of the respective original

179 validation studies (Peters et al., 2004; Vellante et al., 2012). To examine the influence of distal and

180 proximal factors, two sets of generalised linear models were employed to identify predictive factors

181 contributing to hallucination and delusion proneness. A gamma distribution for LSHS-E and a negative

182 binomial distribution for PDI-21 were assumed to account for the high degree of skewness in these

183 distributions. Analyses were performed across the entire sample collapsed across the two time points (with

184 duplicate respondents removed) to gain a continuum understanding of these experiences and beliefs during

185 the COVID-19 outbreak. Variables of interest were assigned as distal (i.e. pre-existing factors typically

186 associated with sociodemographics) or proximal (i.e. relatively state-based and assessed over a recent

187 period of time) to COVID-19, prior to being entered into the model. Distal predictors (age, gender,

188 education, religiosity, living situation, and pre-existing physical and mental health conditions) were

189 entered in Block 1; and proximal predictors (finances and employment status, work location, reduced

190 social contact, negative emotions and loneliness) were entered in Block 2; with hallucination- and

191 delusion-like experiences designated as the dependent variables. The overall number of predictors was

192 within recommended guidelines for minimum sample size requirements (Tabachnick and Fidell, 2007).

193 **3. Results**

194   Survey responses from 1078 participants were recorded in October 2020 and January 2021.

195 Seventy-five participants were removed from the October 2020 dataset because they had also completed

196 the January 2021 survey. There was no evidence of change in LSHS-E, PDI-21, UCLA-LS or DASS-21

197 scores between these two time points within this subsample (see Table B, supplementary section). An

198 additional 228 observations were removed due to missing data, resulting in 850 observations for the

199 generalised linear model of LSHS-E scores and 805 observations for the generalised linear model of PDI-

200 21 scores.

201   Participants had a mean age of 35.9 years, with a standard deviation of 13.0 years (range 18-84

202 years; see Table A in supplementary materials for detailed descriptive statistics and coding of variables for

203 the regression analyses). Of these, 43.5% were male, and 67.6% had received a tertiary education. Most

204 (70.7%) rated religion as not important in their lives, and a minority (16.1%) resided alone. The majority

205 had their employment somewhat affected by the COVID-19 outbreak, with almost half (45.6%) working

206 from home. Most reported a fortnightly household income of less than $7,000K (93.4%). A minority had

207 pre-existing physical health conditions (30.2%) and/or lived experience of a mental illness (22.2%).

208   Scores from all three DASS subscales were highly inter-correlated in the current dataset (.65 ≤ r_s

209 ≤ .72, all $p < .001$). Thus, only total DASS scores were entered into subsequent analyses. Mean LSHS-E

210 was slightly higher in our sample ($M = 11.3$, $SD = 11.4$) than the mean of 10.7 obtained in the original

211 validation study (Peters et al., 2004; Vellante et al., 2012). Conversely, mean PDI-21 was somewhat lower

212 in our sample ($M = 3.4$, $SD = 3.5$) than the mean of 6.7 obtained in the original validation study (Peters et

213 al., 2004; Vellante et al., 2012). Notably, these schizotypy dimensions declined with age and higher

214 education level, and increased with physical and mental illness, loneliness and negative emotions. PDI-21

215 was also significantly higher for females than males, and for those who endorsed greater religiosity, lower

216 income and not working from home (see Table C in the supplementary section for the relevant correlation

217 matrix).

218   Table 1 shows the results of the two generalised linear models elucidating which predictive factors

219 significantly contributed to hallucination- and delusion-like experiences. For LSHS-E, age, education,

220 religiosity, living situation, physical health and mental illness were significant distal predictors in Block 1.

221 Gender did not significantly predict LSHS-E scores. Of the significant predictors form Block 1, only age

222 remained significant in Block 2, with negative emotions and loneliness being significant proximal

223 predictors. The final model was significant ($\chi^2[14] = 264.1$, $p < .001$). For PDI-21, age, gender, education,

224 religiosity, physical health and mental illness were significant distal predictors in Block 1. Living situation

225 did not significantly predict PDI-21 scores. Age, gender, education and religiosity remained significant in

226   Block 2, alongside negative emotions and loneliness, which were significant proximal predictors. The

227   final model was also significant ($\chi^2[14] = 194.8$, $p < .001$).

4. Discussion

229   The current study aimed to investigate how the expression of schizotypy facets, specifically

230   hallucination- and delusion-like experiences, were associated with factors that were distal and proximal to

231   the COVID-19 pandemic . Our hypothesis that financial and employment disruptions, loneliness and

232   reduced social contact, and negative emotions would be associated with more hallucination- and delusion-

233   like experiences was only partly supported . Loneliness and negative emotions predicted both facets of

234   schizotypy independently of sociodemographic factors distal to the pandemic. However, whilst household

235   income and the ability to work from home were both associated with more delusion-like experiences (but

236   not hallucination-like experiences), these associations were weak and were not independent of the distal

237   sociodemographic factors..

238   Younger age was a significant distal predictor of hallucination- and delusion-like experiences in

239   the final regression models, while female gender, higher education levels and reduced religiosity were also

240   associated with delusion-like experiences. These findings are broadly consistent with previous literature.

241   For instance, younger age and lower education are often associated with increased schizotypy (Binbay et

242   al., 2012; van Os et al., 2009), including hallucination- and delusion-like experiences specifically (Knolle

243   et al., 2021), and these relationships continue to be found during the pandemic (Knolle et al., 2021).

244   Moreover, whilst schizotypal experiences tend to be slightly more common in males than females (Binbay

245   et al., 2012; van Os et al., 2009), Knolle et al. (2021) reported more anomalous experiences and beliefs in

246   females than males during the pandemic when modelled with other demographic predictors. The fact that

247   pre-existing physical and mental health predictors (significant in the first step of both regressions) were no

248   longer significant in the final models signifies possible mediation effects of proximal predictors entered in

249   the second step, as supported by preliminary studies (Daimer et al., 2021; Knolle et al., 2021). It is noted

250   that slightly different factors were involved in predicting hallucination-like experiences versus delusion-

251   like experiences. In particular, certain sociodemographic factors (gender, religiosity, household income

252   and working from home) seemingly influenced the development of delusion, but not hallucination,

253   proneness. This underscores the importance of examining schizotypy on a dimensional or facet level,

254   rather than as a single overarching construct.

255   Of the significant predictors identified in the final models, proximal factors associated with

256   negative emotions, reduced social contact and loneliness were of special interest, as these represent

257   possible psychological outcomes stemming from the pandemic. Preliminary research supports the notion

258   that negative affect (Daalman and Diederen, 2013; Laroi et al., 2012) and loneliness (Le et al., 2019;

259   Michalska da Rocha et al., 2018; Narita et al., 2020) may increase the likelihood of transition to psychotic

260   illness in the face of heightened schizotypy. Although loneliness and social isolation are often conflated or

261   used interchangeably, it is of note that these constructs are distinct; being socially isolated does not

262   necessarily equate to feeling lonely and vice versa. This is exemplified in our analysis, where loneliness,

263   but not reduced social contact, significantly contributed to our two schizotypy dimensions. Indeed, the

264   correlation between loneliness and reduced social isolation did not survive correction for multiple

265   comparisons (Table B, supplementary section), though we do note that our measure of reduced social

266   contact since the onset of the pandemic (relative to pre-pandemic levels) does not necessarily equate to

267   social isolation per se. Regardless, there are steps people can still take to tackle loneliness, including

268   regularly engaging with loved ones virtually or through other means. In light of this, raising public

269   awareness about the importance of managing negative emotions and feelings of loneliness during these

270   challenging times might be of benefit.

271   Relative to figures reported in the respective original validation research (Peters et al., 2004;

272   Vellante et al., 2012), our mean scores for LSHS-E were similar, but our mean scores for PDI-21 were

273   somewhat lower. This could be attributed to demographic differences of samples involved across these

274   studies (e.g. Australia versus Italy and the UK, general population versus student cohorts, cohort effects

275   over time, etc.). By contrast, the DASS scores currently sampled were similar to those reported in a

276   previous study earlier in the pandemic, and these levels of negative emotions were substantially high

277   compared to pre-pandemic normative data from Australia (Rossell et al., 2021). Psychological research in

278   previous pandemics has suggested that some adverse impacts to mental health may only emerge after a

279   prolonged time lag, and could persist for significant periods thereafter (Ayers and Yellowlees, 2008).

280 Given the expected delays from pandemic onset to full manifestation of mental health repercussions, as

281 well as the fact that the COVID-19 pandemic is continuing in Australia (and globally), the full extent of its

282 impact on schizotypy expression will likely depend on a myriad of factors moving forward, such as

283 personal, social or economic losses and other unfavourable events, such as further lockdowns. Moreover,

284 the impact of the COVID pandemic on people's mental health may be exacerbated in those experiencing

285 socioeconomic disadvantage (O'Sullivan et al., 2020). Further research is thus required to elucidate these

286 complex interrelationships.

287 The current study had several limitations. First, we did not measure schizotypy scores before the

288 onset of the COVID-19 pandemic in the current sample. Moreover, although we categorised loneliness

289 and negative affect as being proximal to the pandemic, the grouping of these variables encompasses their

290 potential for change (relative to the distal factors) based on the timeframe used for their assessment (i.e.

291 self-reporting the occurrence of experiences within the past week or the past four weeks). In the absence

292 of pre-pandemic data, we cannot determine with certainty whether the reported levels of schizotypy,

293 loneliness and negative affect represent changes that have occurred since the onset of the pandemic (i.e.

294 COVID-related), or whether they have remained stable despite the pandemic (i.e. intransient despite

295 COVID). Indeed, even comparisons with pre-pandemic normative data is limited for the reasons

296 mentioned above. Second, the fluctuating time course and severity of differing pockets of COVID-19

297 outbreaks across the various Australian states meant that we were unable to accurately account for state-

298 wise variations, even though it was apparent that Victoria (where the majority of our respondents resided)

299 had borne the brunt of COVID-infected numbers, related fatalities and lockdowns. As an added point of

300 consideration, our combined data across two time points may help to balance out some of the differences

301 owing to disparities in location/timing of COVID impacts in Australia, although loneliness, negative affect

302 and schizotypal experiences appeared relatively stable amongst people who completed the survey at both

303 time points. Third, our variable involving reduced social contact attributed to COVID restrictions was

304 employed as a proxy for social isolation, but the validity of this assumption may be questioned, depending

305 on how social isolation has been defined within the context under investigation. Finally, we did not rate

306 dimensional distress, preoccupation and conviction for the PDI-21 in the current study, owing to

307 constraints around study design and administration time. Having this information would have been

308   beneficial in facilitating a more nuanced understanding of delusion-like schizotypy experiences amidst the

309   COVID-19 pandemic.

310   The current study design permitted a series of cross-sectional indicators of population mental

311   health over the course of the COVID-19 outbreak, but was not longitudinal in nature. Future research

312   would benefit from focusing on further longitudinal studies aimed at fully elucidating the complex

313   interplay amongst schizotypy expression, negative affect and loneliness. Despite the devastation wreaked

314   by the pandemic, ensuing lockdowns and other social restrictions enacted do offer an unfortunate, but

315   unique, opportunity to study resultant effects on constructs such as schizotypy expression, impacted by

316   these events. This is especially so in countries like Australia, where medical aspects of COVID-19 have

317   been relatively well-managed. In fact, this begets the question of whether nations facing less severe

318   COVID-19 outbreaks may observe smaller changes in population schizotypy levels, with continued

319   longitudinal research imperative in capturing these longer-term effects. Related to this, future studies may

320   also examine other predictors not assessed in the current study, for instance involving the consumption of

321   alcohol, tobacco or other illicit substances and social media use, where preliminary results suggesting

322   significant influences exist (e.g. Knolle et al., 2021). Constructive findings from this avenue of research

323   may be applied to mitigate the potentially adverse impact of negative psychological and social variables

324   spurring the transition of typical schizotypy expression to serious psychotic illness.

325   In summary, negative emotions and loneliness were associated the expression of hallucination-

326   and delusional-like experiences during the COVID-19 pandemic. Given the adverse influences on our

327   general health, as well as specific impact in relation to increased schizotypy, public health campaigns to

328   tackle these negative psychological outcomes, with dedicated interventions targeting loneliness, might be

329   warranted moving forward.

Table 1

Generalised linear models elucidating significant predictors contributing to hallucination- and delusion-like experiences (N=805-850)

	Hallucination-like experiences (LSHS-E)					Delusion-like experiences (PDI-21)				
	B	*Wald*	*p*	*Exp(B)*	*95% CI*	*B*	*Wald*	*p*	*Exp(B)*	*95% CI*
Block 1 (distal only)										
Age	-.015	38.3	<.001	0.985	0.981-0.990	-.016	25.4	<.001	0.984	0.979-0.990
Gender	.019	0.1	.751	1.019	0.908-1.143	.223	8.3	.004	1.250	1.073-1.455
Education	.132	4.8	.028	1.142	1.014-1.285	.412	26.9	<.001	1.510	1.293-1.765
Religiosity	-.163	4.7	.030	0.850	0.733-0.984	-.539	29.9	<.001	0.583	0.481-0.707
Living situation	.196	6.2	.013	1.217	1.042-1.420	.026	0.1	.809	1.026	0.831-1.267
Physical health	-.257	14.0	<.001	0.773	0.676-0.885	-.239	7.1	.008	0.787	0.660-0.939
Mental illness	-.468	41.2	<.001	0.626	0.542-0.723	-.354	13.8	<.001	0.702	0.583-0.846
Block 2 (distal and proximal)										
Age	-.008	11.8	.001	0.992	0.987-0.996	-.010	7.3	.007	0.990	0.983-0.997
Gender	-.034	0.3	.571	0.967	0.861-1.086	.205	5.6	.018	1.228	1.036-1.454
Education	.049	0.6	.432	1.050	0.929-1.187	.260	8.4	.004	1.298	1.087-1.548
Religiosity	-.125	2.7	.102	0.883	0.760-1.025	-.583	28.7	<.001	0.558	0.451-0.691
Living situation	.141	3.2	.075	1.151	0.986-1.344	-.029	0.1	.805	0.971	0.769-1.226
Physical illness	-.096	1.8	.184	0.909	0.789-1.046	-.085	0.7	.405	0.919	0.752-1.122
Mental illness	-.153	3.6	.057	0.859	0.734-1.004	-.105	0.9	.344	0.901	0.725-1.119
Household income	.066	0.3	.570	1.068	0.851-1.342	.293	2.7	.099	1.340	0.947-1.897
Employment	-.151	1.7	.192	0.860	0.685-1.079	.091	0.3	.605	1.095	0.777-1.543
Working from home	.015	0.1	.797	1.015	0.905-1.139	.149	2.9	.087	1.161	0.978-1.378
Reduced social contact	.002	<.01	.943	1.002	0.954-1.052	.014	0.1	.703	1.014	0.945-1.088
Negative emotions (DASS-21)	.014	76.8	<.001	1.014	1.011-1.017	.011	26.0	<.001	1.011	1.007-1.015
Loneliness (UCLA-LS)	.056	20.3	<.001	1.058	1.032-1.084	.078	18.9	<.001	1.081	1.044-1.119

Note. DASS-21=Depression Anxiety Stress Scales; UCLA-LS=University of California, Los Angeles Loneliness Scale; LSHS-E=Launay-Slade Hallucinations Scale-Extended; PDI-21=Peters Delusions Inventory. See Table A for coding of categorical variables.

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Table A

Descriptive statistics

Variable	Levels (coding)	*N* (%) or *M* (*SD*)
Age	-	35.9 (13.0)
Gender	Male (1); Female (2)	370 (43.5); 480 (56.5)
Education	Less than tertiary (1); Tertiary or higher (2)	275 (32.4); 575 (67.6)
Religiosity	Not important (1); Neutral (2); Important (3)	601 (70.7); 99 (11.6); 150 (17.6)
Living situation	Living alone (1); Other arrangements (2)	137 (16.1); 713 (83.9)
Physical illness	No (1); Yes (2)	593 (69.8); 257 (30.2)
Mental illness	No (1); Yes (2)	661 (77.8); 189 (22.2)
Household income	<$7,000 (1); $7,000 or more (2)	794 (93.4); 56 (6.6)
Employment	No impact (1); Some or significant impact (2)	57 (6.7); 793 (93.3)
Work from home	No (1); Yes (2)	462 (54.4); 388 (45.6)
Reduced social contact (hours/week)	-	-0.33 (1.13)
DASS-21	-	28.0 (23.7)
UCLA-LS	-	9.2 (2.8)
LSHS-E	-	11.3 (11.4)
PDI-21	-	3.4 (3.5)

Note. *N* = number; *M* = mean; *SD* = standard deviation. DASS-21 = Depression Anxiety Stress Scales; UCLA-LS = University of California, Los Angeles Loneliness Scale; LSHS-E = Launay-Slade Hallucinations Scale-Extended; PDI-21 = Peters Delusions Inventory

Table B

Comparison of distributions and Spearman correlations for waves 7 and 10 for participants who completed both surveys (N = 75)

	Wave 7 (October 2020) (*N* = 74-75)		Wave 10 (January 2021) (*N* = 72-75)		Wilcoxon Signed Rank Test		Spearman Rank-Order Correlation	
	M	*SD*	*M*	*SD*	z-value	*p*-value	*r*	*p*-value
(LSHS-E)								
Intrusive Thoughts	3.95	3.43	3.76	3.40	.76	.45	.78	<.001
Vivid Daydreams	1.57	2.77	1.37	2.48	.71	.48	.60	<.001
Multisensory HLEs	3.32	3.98	2.81	3.35	1.04	.30	.59	<.001
Auditory Visual HLEs	1.64	2.88	1.26	2.18	1.51	.13	.59	<.001
Unusual Sensory Experiences	10.54	10.40	9.26	9.06	1.36	.18	.75	<.001
(PDI-21)								
Atypical Thinking Styles	3.18	3.70	2.78	3.07	.31	.76	.74	<.001
(UCLA-LS)								
Loneliness	9.24	2.64	9.09	3.26	.71	.48	.77	<.001
(DASS-21)								
Negative Emotions	26.69	21.97	23.93	21.48	1.28	.20	.75	<.001

Note. *M* = mean; *SD* = standard deviation; DASS-21 = Depression Anxiety Stress Scales; UCLA-LS = University of California, Los Angeles Loneliness Scale; LSHS-E = Launay-Slade Hallucinations Scale-Extended; PDI-21 = Peters Delusions Inventory.

Table C

Spearman correlation matrix amongst variables of interest (N=805-850)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Age	1														
2. Gender	.13*	1													
3. Education	.13*	.05	1												
4. Religiosity	.15*	.02	.03	1											
5. Living situation	-.14*	-.08	-.04	.01	1										
6. Physical illness	.22*	.14*	-.02	.01	-.07	1									
7. Mental illness	-.07	.16*	-.10	-.06	-.06	.32*	1								
8. Household income	.05	-.05	.07	-.01	.12*	-.03	-.06	1							
9. Employment	.10	-.03	.06	.00	-.00	.02	-.09	.04	1						
10. Work from home	.05	.04	.24*	.01	.03	.01	-.07	.08	.15*	1					
11. Reduced social contact	-.04	-.04	.01	.03	.02	-.04	-.05	.04	-.01	-.01	1				
12. DASS-21	-.19*	.09	-.13*	-.04	-.02	.24*	.42*	-.07	-.06	-.03	-.10	1			
13. UCLA-LS	-.13*	-.09	-.17*	-.01	-.09	.11*	.23*	-.08	-.06	-.08	-.08	.51*	1		
14. LSHS-E	-.17*	.04	-.13*	.00	-.05	.16*	.31*	-.06	-.05	-.04	-.07	.57*	.40*	1	
15. PDI-21	-.14*	-.09	-.23*	.15*	.02	.10*	.19*	-.10*	-.06	.12*	-.02	.43*	.42*	.54*	1

Note. DASS-21 = Depression Anxiety Stress Scales; UCLA-LS = University of California, Los Angeles Loneliness Scale; LSHS-E = Launay-Slade Hallucinations Scale-Extended; PDI-21 = Peters Delusions Inventory. * Significant at .001 level (two-tailed), to allow for multiple comparisons. See Table A for coding of categorical variables.