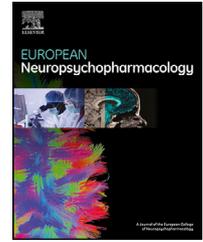




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SHORT COMMUNICATION

Initial response to the COVID-19 pandemic on real-life well-being, social contact and roaming behavior in patients with schizophrenia, major depression and healthy controls: A longitudinal ecological momentary assessment study

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KEYWORDS

COVID-19;
 Pandemic;
 Schizophrenia;
 Depression;
 Mental health risk;
 Vulnerable population

Abstract

The COVID-19 pandemic strongly impacted people's daily lives. However, it remains unknown how the pandemic situation affects daily-life experiences of individuals with preexisting severe mental illnesses (SMI). In this real-life longitudinal study, the acute onset of the COVID-19 pandemic in Germany did not cause the already low everyday well-being of patients with schizophrenia (SZ) or major depression (MDD) to decrease further. On the contrary, healthy participants' well-being, anxiety, social isolation, and mobility worsened, especially in healthy individuals at risk for mental disorder, but remained above the levels seen in patients. Despite being stressful for healthy individuals at risk for mental disorder, the COVID-19 pandemic had little additional influence on daily-life well-being in psychiatric patients with SMI. This highlights the need for preventive action and targeted support of this vulnerable population.

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1. Introduction

The COVID-19 pandemic has a pervasive impact on people's daily lives (Haleem et al., 2020). While many psychiatrists were especially concerned about a potential worsening of symptoms in individuals already suffering from severe mental illnesses (SMI; Ünützer et al., 2020, Yao et al., 2020), stress caused by the social isolation and other life restrictions resulting from the COVID-19 pandemic can also lead to significant mental health impairments in healthy individuals, especially those at risk for mental disorder (Berhe, Höflich et al. 2022). This is suggested by a worldwide increase in fear (Betsch, Wieler et al. 2020; Brühlhart, Klotzbücher et al. 2021) and a slight and transient increase in symptoms, especially related to depression, during the first pandemic phase in the general population (Robinson, Sutin et al. 2022).

Here, we therefore aimed to investigate how initial pandemic-driven events affected well-being of patients with schizophrenia spectrum disorder (SZ) or major depression (MDD) as well as healthy controls (HC) with different levels of mental health risk, using longitudinal ecological momentary assessment (EMA) and mobile sensing data before (preacute) and during (acute) the first and second waves of the COVID-19 pandemic in Germany (Fig. 1A).

2. Materials and methods

Participants provided written informed consent approved by the institutional review board of Heidelberg University, Germany. Three groups of participants ($n = 20$ [SZ], $n = 24$ [MDD] and $n = 21$ [HC]) were subjected to an EMA protocol (smartphone-based self-ratings, step counter, real-life GPS location tracking) and psychological inventories (Fig. 1B) across 24 weeks. Participants reported twice a day on their daily-life well-being (valence, energy, calmness), social context (loneliness, being alone) and anxiety level (fearfulness) using e-diaries (details in supplement).

First, to test whether patients' e-diary ratings differed from HC, we evaluated the full sample ($n = 65$) across the whole measurement period (February–November 2020, including both infection waves).

Second, to investigate the effect of the COVID-19 pandemic on participants' daily experiences, we considered two independent samples during the first ($n = 23$; 02/01/20 - 03/31/20) and second

($n = 31$; 09/14/20 - 10/30/20) infection waves separately. For each wave, we divided the relevant time period into two non-overlapping phases. Here, we defined preacute (6 weeks) and acute (2 weeks) phases, representing time periods before and during the peak of a given wave, respectively (Fig. 1A). Outcome measures, representing relevant aspects of daily-life that were potentially influenced by the pandemic situation, i.e., well-being, anxiety, social isolation and mobility (Fig. 2), were analyzed using multilevel models with group (SZ, MDD, HC) and phase (preacute, acute) as predictors, and time of day, time of day squared (level 1), and sex (level 2) as covariates.

Third, we compared ratings of HC before the first and second waves. Finally, we explored whether healthy individuals that are at risk for mental disorder (indexed by, e.g., pathological personality traits) are particularly vulnerable to the COVID-19 pandemic. For this, we included a mental health risk factor (MHR), derived from a principal component analysis of mental health risk measures, as a moderator in our multilevel models (see supplement, eTable3).

3. Results

Consistent with prior literature (Myin-Germeys, Peeters et al. 2003; Schneider, Reininghaus et al. 2017), both patient groups reported reduced well-being (SZ: valence: $p \leq 0.040$, MDD: valence, energy, calmness: p -values < 0.001), increased anxiety level (SZ and MDD: fearful $p \leq 0.004$), and social isolation (SZ: lonely, alone: p -values ≤ 0.025 ; MDD: lonely: $p < 0.002$) as compared to HC across the whole sample and measurement period. SZ patients engaged in more physical activity (i.e., steps) compared to MDD patients ($p = 0.038$), but spatial mobility was not different between groups (cells: $p > 0.07$).

During the first wave (Fig. 2B), we observed a decrease in well-being (valence, calmness: p -values < 0.001) as well as an increase in anxiety (fearful: $p < 0.001$) among HC. In contrast, patients showed a slight improvement (SZ: valence, energy, calmness, fearful: p -values < 0.010 , MDD: calmness, fearful: p -values < 0.038) or no change in ratings (MDD: valence, energy: p -values > 0.05). In line with governmental stay-at-home recommendations, MDD and HC groups spent more time alone (alone: $p \leq 0.026$) and all groups took fewer steps (steps: $p \leq 0.003$).

During the second wave (Fig. 2C), we observed a similar improvement in the well-being of SZ patients as during

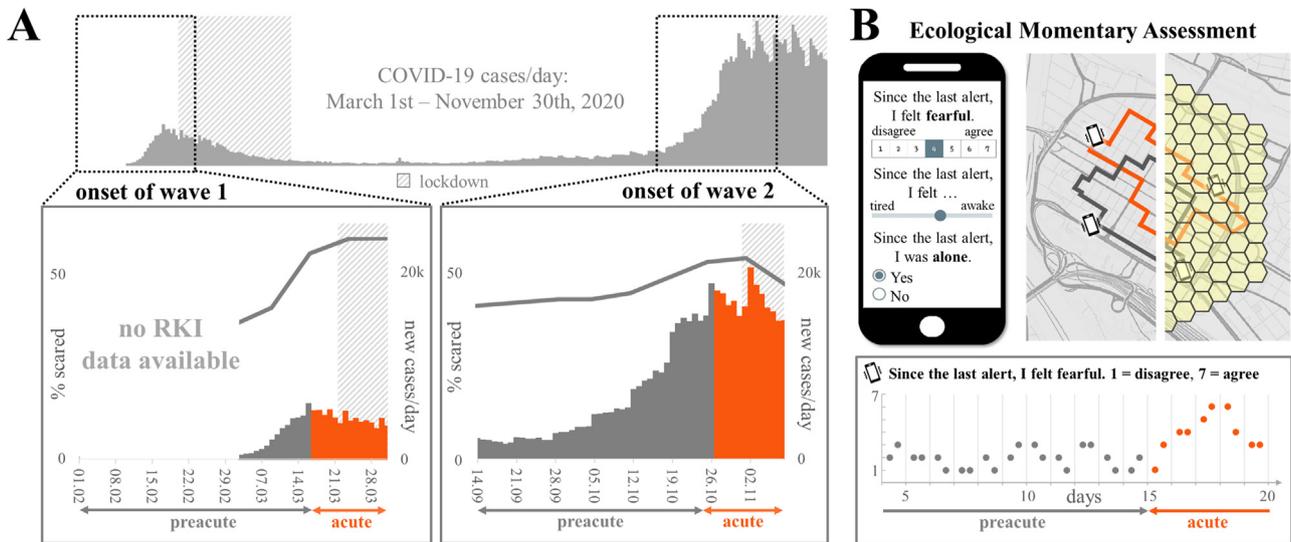


Fig. 1 Definition of time phases and methods.

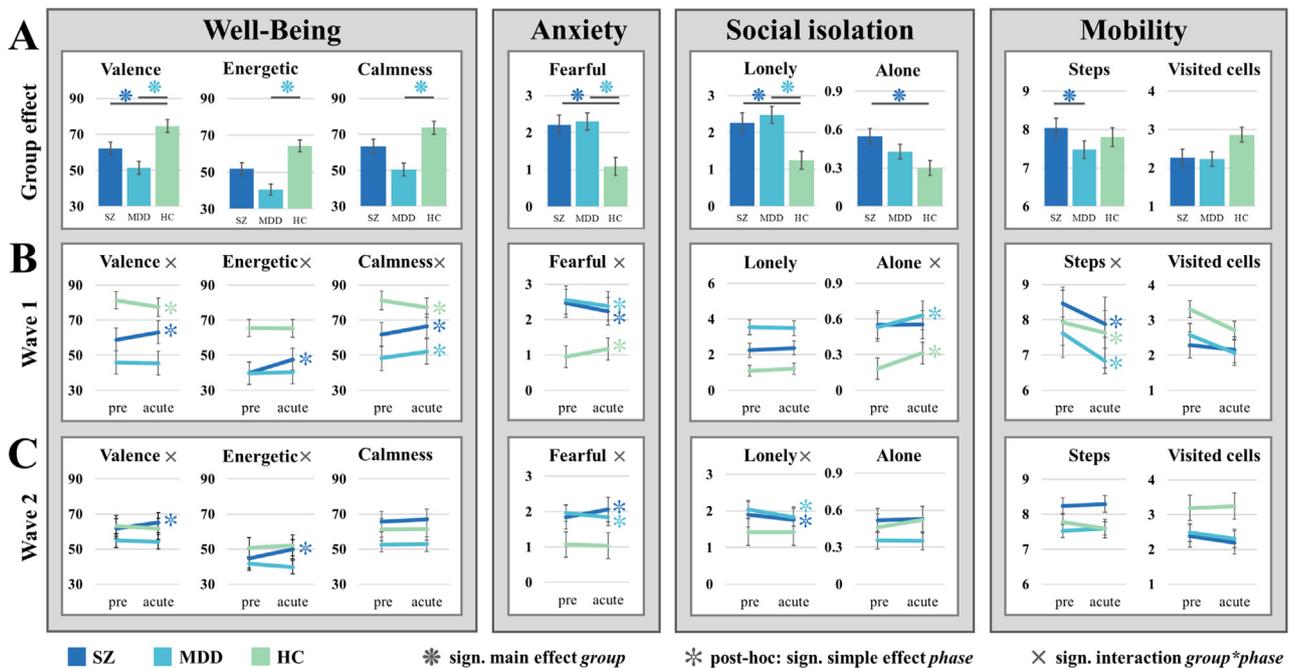


Fig. 2 Effects of group and wave.

the first wave (valence, energy: p -values < 0.017), with a slight increase in fearfulness (fearful: $p < 0.001$). MDD patients' well-being remained stably low (all p -values > 0.05), while fearfulness and loneliness improved (fearful, lonely: p -values < 0.008). Time spent alone, the number of steps, and spatial roaming did not change in any group.

Interestingly, the HC tended to show decreased well-being (valence: $p = 0.052$, energy: $p = 0.056$, calmness: $p = 0.042$) before the second wave compared to ratings of HC before the first wave (Fig. 3A). Moreover, HC showed no changes in any rating during the second wave (all p -values > 0.05 ; Fig. 2C).

Finally, our exploratory subgroup analysis revealed a significant moderating role of a general mental health risk

factor in rating changes from preacute to acute phases of the first wave. Here, HC with median to high MHR showed the strongest negative change in ratings (valence, calmness, fearful, lonely: p -values < 0.001 ; Fig. 3B).

4. Discussion

Despite the initial concern of many psychiatrists about a mental health deterioration of psychiatric patients during the pandemic (Unützer et al., 2020; Yao et al., 2020), we found no evidence for a negative impact of the pandemic situation on daily-life well-being in our patient samples beyond the highly significant reduction in well-

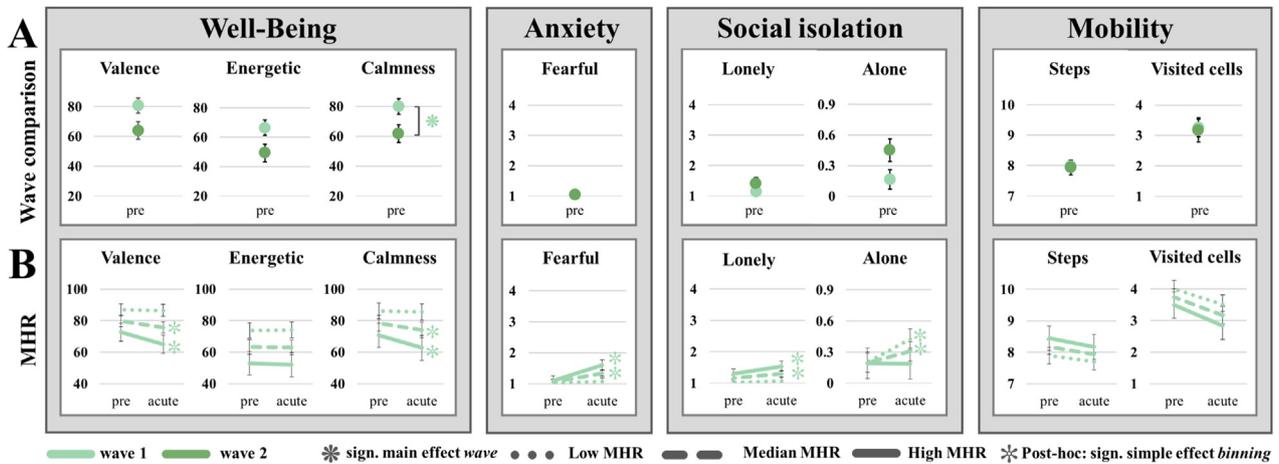


Fig. 3 Wave comparison and mental health risk in healthy controls.

being associated with diagnosis. This stability could be attributed to various factors. First, almost all patients had access to mental health services, including medication (SZ: $n = 15$; MDD: $n = 18$) which might have buffered the adverse impact of the pandemic. Second, avoidance strategies (e.g., social withdrawal), normally maladaptive, temporarily transformed into beneficial and socially accepted coping behavior during pandemic restrictions. Third, the reduction in everyday stressors during the stay-at-home period (Pirkis, John et al. 2021) may have outweighed the negative impact of isolation for this population. Finally, the stigma of loneliness may have eased during a time where social isolation was proscribed.

Among healthy controls, however, we found a change in ratings during the acute phase of the first wave, which corresponds to the increase in fear, concern, and worry in the general population (Betsch, Wieler et al. 2020; Shi, Lu et al. 2020). Interestingly, HC entered the second wave with an already reduced well-being (as compared to the first wave), which remained stable at a low level during the acute phase.

Moreover, an initial increase in anxiety and a reduction in well-being during the first wave was most pronounced in healthy individuals with high MHR load. This suggests that at-risk individuals among the healthy were especially prone to pandemic-related stressors. Vulnerability-stress models, such as the hopelessness theory (Alloy, Abramson et al. 1988), may explain the increasing prevalence in mental health problems among previously healthy individuals who experienced negative pandemic related conditions.

While we are aware that a small sample size may affect statistical power, the number of prompts provided within (level 1) and across (level 2) all participants was quite high. Thus, there was sufficient power assumed to detect general differences across and between groups (SZ, MDD, HC), phases (preacute, acute), and waves (first, second). Although the reported results in psychiatric patients resemble clinical characteristics of previously reported large cohorts (Fountoulakis, Dragioti et al. 2019; van Noorden, van Fenema et al. 2012) and the demographic characteristics of healthy controls were comparable to those of the patient sample, the small sample size remains a clear limitation of

the study. Especially the subgroup analysis results in healthy controls have to be interpreted with caution.

Nevertheless, this study resembles the results of a meta-analysis of longitudinal cohort studies comparing mental health before versus during COVID-19 in 2020 (Robinson et al. 2022). It concludes a subtle increase in mental health symptoms in the general population soon after the pandemic outbreak, which decreased to pre-pandemic levels by mid 2020, while there was no evidence of any change in symptoms among patients with a pre-existing mental health condition.

In summary, the prospective design of this study and the prepandemic real-time data in SMI patients and HC offer the opportunity to observe effects of the pandemic onset as they unfold on an intra-individual level. As shown, stressful events, such as the COVID-19 pandemic, have a more pronounced negative influence on the mental states of at-risk healthy individuals rather than patients suffering from SMI. This highlights the need for preventive action as well as targeted support of this vulnerable population. Nonetheless, further investigations are needed to better understand the specific effects of threatening circumstances, such as pandemic outbreaks, on the mental health of both patients and healthy individuals.

Contributors

AB, AM, MR, IR, UE-P, CvG, HT and AM-L designed the study and wrote the protocol. AB, AM, IR, MR, OB, SL, SL and AZ analyzed the data. AB wrote the first draft of the manuscript. All authors participated in interpreting the data and developing further stages and the final version of the paper.

Declaration of Competing Interest

AM-L has received consultant fees from Agence Nationale de la Recherche, Brainsway, CISSN (Catania International Summer School of Neuroscience), Daimler und Benz Stiftung, EPFL Brain Mind Institute, Fondation FondaMental, Hector

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UE-P reports consultancy for Boehringer-Ingelheim. The other authors report no biomedical financial interests or potential conflicts of interest.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.euroneuro.2023.01.008](https://doi.org/10.1016/j.euroneuro.2023.01.008).

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