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Research paper

How the past shapes the present: Differential mental health trajectories in individuals with and without experiences of childhood abuse and neglect in the context of the COVID-19 pandemic

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ABSTRACT

Objective: In a large population-based cohort, this study investigates differential trajectories of mental distress for individuals with and without experiences of childhood abuse and neglect during the COVID-19 pandemic.
Methods: The data were derived from the Gutenberg Health Study (GHS) and its add-on, the Gutenberg COVID-19 Study (GCS). The sample included 2744 participants (49.9 % women), mean age 61.25 years (*SD* = 12.17). Mental health outcomes were assessed using validated instruments, including the PHQ-8 for depression (using the PHQ-9 suicidal-ideation item separately), GAD-2 for anxiety, UCLA 3-item scale for loneliness, and the Childhood Trauma Screener (CTS). ANOVAs and multiple linear and logistic regression models were used to analyze changes in mental distress symptoms in relation to the extent of experienced childhood abuse and neglect.
Results: Findings indicated varied impacts of the pandemic on different mental health symptoms: In general, anxiety levels showed a slight decrease, while depression, loneliness, and suicidal ideation increased. Notably, individuals with more abuse and neglect during childhood did not uniformly experience the largest increases in symptoms. For instance, those with a history of childhood abuse and neglect showed smaller increases in loneliness, possibly due to already elevated baseline levels.
Conclusions: The study shows that considering individual histories of childhood trauma adds to the understanding of mental health trajectories during the pandemic. The findings highlight the complexity of mental health responses and suggest that pre-existing vulnerabilities and coping mechanisms significantly influence mental health outcomes in crises.

1. Introduction

Following the stagnation of public life (with the closure of educational institutions and childcare facilities, cuts in the labor market, and contact restrictions), attention has been drawn to potential mental health sequelae of the COVID-19 pandemic which could constitute a

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public health crisis in their own right (Mari and Oquendo, 2020) and have, meanwhile, been the focus of many studies (on November 24 2025, searching PubMed for "COVID-19" & "mental health" returned 35.919 results).

The COVID-19 pandemic, and the wide-ranging restrictions implemented to contain it, can be understood along several complementary stress frameworks. The widespread disruptions of daily routines affecting the whole of society and all domains of life, as well as the presence of a previously unknown, invisible health threat, can be seen as an unexpected, non-normative *life event*. According to Holmes and Rahe (1967), life events induce stress because they require the individual to adapt and to restore a state of mental balance. Consequently, life events can contribute to unfavorable mental and physical health changes (Hsu, 2011), although their effects are not uniform, as life events create demands for adaptation, and whether they result in negative outcomes depends on the broader constellation of risk and protective factors. At the same time, the prolonged duration of social restrictions, repeated waves of infection, and persistent uncertainty rendered it a chronic stress exposure for many individuals. Moreover, for those confronted with severe illness, bereavement, or acute fear for themselves or close others, aspects of the pandemic also met criteria typically associated with potentially traumatic events.

The threat of serious injury eliciting feelings of intense fear is a major characteristic of incidents with traumatic quality (Shevlin et al., 2020). Living through the pandemic has been labeled a collective trauma, i.e., an epidemiological as well as psychological trauma (American Psychological Association, 2020). Additionally, there has long been a prevailing *uncertainty*, both objectively and subjectively (with respect to one's personal degree of danger; and regarding future developments). Uncertainty has been a focus of accounts of community-wide trauma as well as of dealing with chronic illness (Afifi, 2010) and was related to anxiety and avoidance (Kuang and Wilson, 2017; Peters et al., 2017). This multi-layered stress character was further intensified by secondary stressors, as public health measures that serve to curb the spread of the virus (such as physical distancing) can result in job losses, financial insecurity, intensified caregiving demands (Tibubos et al., 2021), and aggravate loneliness (Ernst et al., 2022a, 2022b) which already constituted a health risk in normal times (Buecker et al., 2020; Saltzman et al., 2020). A review of studies conducted during previous pandemics reports negative, sustained effects of quarantine measures, such as post-traumatic, anxiety and depression symptoms, irritability and anger (Röhr et al., 2020). German surveys reported increases in depression symptoms and loneliness in Spring 2020 (Liebig et al., 2020).

However, the effects of these disruptions have been heterogeneous, with variations influenced by a range of factors that continue to be the subject of empirical research. This heterogeneity in mental health outcomes is largely attributed to differences in individual circumstances, such as socioeconomic status, pre-existing mental health conditions, and the availability of social support systems (Ellwardt and Präg, 2021; Kunzler et al., 2023). Longitudinal and large-scale population studies have shown that certain traits and capacities such as optimism, perceived control, and self-efficacy served as buffers against rising depression and anxiety during periods of stringent social restrictions (e.g., Veer et al., 2021). Flexible emotion regulation was likewise associated with lower distress and better adaptation as the pandemic unfolded (Panzeri et al., 2021) Findings from multinational studies additionally indicate that resilience is not merely the absence of vulnerability but reflects active coping processes that help maintain psychosocial functioning over time, even under chronic stress exposure (Killgore et al., 2020). Integrating these resilience processes into the conceptual framework underscores that heterogeneity in mental health responses during the pandemic emerged not only from differential exposure to risk but also from variation in individuals' resources and adaptive capacities. Investigating these variations necessitates comprehensive longitudinal studies, which pose significant challenges due to their complexity and the extensive resources required. Thus, while the immediate impacts of the pandemic on mental health have been widely documented, the nuanced understanding of its long-term effects remains an evolving field of study.

Tragically, evidence suggests that the pandemic has mostly affected those who were already socially and economically disadvantaged: There are considerable differences in risk exposure, resources to compensate for risks, and the ability to adapt to the new situation that map onto and interact with preexisting social disparities. Vulnerabilities such as mental health problems, low social participation, adverse childhood experiences (ACEs), experiences of violence in adulthood, little social support, and low socioeconomic status often accumulate and are mutually reinforcing. Experiences of domestic violence, growing up in a household with intimate partner violence (IPV), parental mental illness or substance abuse strongly affect health and psychosocial functioning later in life (Ernst et al., 2022a, 2022b; Witt et al., 2019). This transgenerational transmission of burdens is fatal - low socioeconomic status, the experience of violence and mental health problems translate into mental and somatic illness (Barboza Solís et al., 2015; Kelly-Irving et al., 2013) and reduce life expectancy by decades (Grummitt et al., 2021).

Childhood adversity is associated with numerous detrimental physical and mental health outcomes later in life, including social isolation and loneliness, accelerated ageing and premature mortality, and researchers have proposed mediators of this association, e.g., having fewer and less satisfying/more stressful relationship experiences while growing up (McCrory et al., 2022), as well as overarching personality psychopathology (Ernst et al., 2022a, 2022b). On the contrary, early positive experiences of emotional warmth and security with one's caregivers implicate mental representations of others as supportive and empathic (secure attachment patterns, following Bowlby (Bowlby, 1969)) that have been linked to more relationship security in adulthood, better mental health, and adaptive help-seeking behavior (Stanton and Campbell, 2014).

Hence, while the pandemic entailed stress, risk and resilience factors, both as individual differences or as characteristics of the environment, influenced how well individuals were able to adjust, contributing to the differing levels of strain: For example, In the transactional stress model (Folkman and Lazarus, 1984), stress is conceptualized not as a property of the event itself but as the result of a dynamic transaction between the individual and their environment. Whether an event becomes stressful depends on the individual's appraisal, as stress arises when perceived demands exceed perceived resources, making coping efforts necessary. Coping, i. e. the psychological management of a challenge - such as the psychological crises of the pandemic - depends on the situational as well as psychological resources that are available to a person, both of which are relatively stable. Empirical research has also highlighted their role within the pandemic context, as the perception of everyday stresses and strains and subjective well-being was shaped by personality (Modersitzki et al., 2020). Importantly, individual differences, dispositions and resources do not arise in a vacuum. They themselves are shaped by the aforementioned earlier experiences and developmental pathways. By way of example, survivors of childhood adversity reported less social support and more distress in a pre-pandemic assessment (Tibubos et al., 2018), and better reflective functioning, which significantly develops from positive early relationship experiences, played a vital role in adapting to the COVID-19 pandemic. This ability, encompassing empathy, emotional regulation, and understanding mental states, was a highly significant protective factor against loneliness, even in the face of social isolation (Ernst et al., 2024).

Thus, the pandemic seems to have further exacerbated the existing risks for people with ACEs, as COVID-19 burden mediated the association between ACEs and emotional exhaustion in a large sample of healthcare professionals (Clemens et al., 2021). However, so far, there is a lack of high-quality investigations that test the hypothesis of whether a history of childhood adversity is a general modifier of the mental health response to the pandemic with regard to the German context. Respective knowledge would be instrumental in informing prevention and

intervention efforts and in improving pandemic preparedness in the community. While a previous investigation from Germany (Clemens et al., 2022) linked a history of child maltreatment with higher levels of depressive symptoms within a large community sample, it relied on an investigation of cross-sectional data (thus giving no insight into whether this observation was due to an increase in symptoms in this group) and addressed only one kind of mental distress.

1.1. Aim of the present research

The present study aimed to determine whether pre-existing childhood adversity predicts differential changes in mental health during the COVID-19 pandemic. Harnessing a large, prospective community cohort, we examined four outcomes (depression symptoms, anxiety symptoms, loneliness, and suicidal ideation) using a true pre-pandemic baseline and three repeated assessments during the pandemic. Our central research question was whether individuals showed distinct trajectories or magnitude of change in mental distress from before to during the pandemic in relation to differing levels of childhood adversity. Additionally, we tested whether observed associations remained after adjusting for sociodemographic and psychosocial covariates that are both relevant for mental health and unequally distributed between individuals with and without childhood adversity - such as educational attainment and socioeconomic status.

2. Methods

2.1. Study procedure and participants

The Gutenberg Health Study (GHS) is a population-based, prospective, single-center cohort study initiated at the University Medical Center Mainz. The baseline assessment of the GHS was conducted between 2007 and 2012. Its primary aim is to improve individual risk prediction for various illnesses, including cardiovascular diseases, as well as for mental disorders. To achieve this, the study examines a wide range of factors such as lifestyle, psychosocial factors, environmental influences, laboratory parameters, and the extent of subclinical disease.

During the baseline visit, 15,000 individuals aged 35–74 years were invited to a detailed five-hour examination program at the study center. The sample was drawn randomly from the local registry of the city of Mainz and the district of Mainz-Bingen. It was stratified equally for sex (self-reported as the categories male, female) and residence (city, country) and in equal strata for decades of age. This baseline assessment is followed by a computer-assisted telephone interview after 2.5 years and a detailed follow-up examination after five years, similar to the baseline visit. The study plans to conduct further follow-up visits to continue monitoring the cohort (Höhn et al., 2015; Wild et al., 2012).

As its add-on, the Gutenberg COVID-19 Study (GCS), which was started in 2020, examines 10,250 individuals including 8121 from the cohort of the ongoing GHS and 2129 newly enrolled younger individuals during the pandemic. This data collection seeks to trace the impact of the pandemic on physical and mental health and to analyze the actual spread of COVID-19 in Rhineland-Palatinate as well as its course and risk factors. All study contents and procedures were approved by the ethics committee of the Medical Chamber of Rhineland-Palatinate and the local data safety commissioner approved all study protocols and documents.

The data used in the present study covered four time points: GHS Follow-up 4 (conducted 2017–2020), the baseline assessment of the Gutenberg COVID-19 Study (GCS Baseline; conducted between October 2020 and April 2021), the GCS 4-month follow-up (conducted between March and June 2021), and the GCS 12-month follow-up (conducted between May 2022 and November 2022). For ease of communication, the assessments are labeled as follows:

Pre-pandemic baseline = GHS Follow-up 4, Pandemic T1 = GCS Baseline, Pandemic T2 = GCS 4-month follow-up, and Pandemic T3 = GCS 12-month follow-up.

Analyses only included those whose data was available at all four time points. Thus, the newly recruited younger sample could not be included. Since the GHS FU4 survey overlaps with the onset of the pandemic, we chose a cut-off date (January 27, 2020 – the date of the first case of COVID-19 in Germany, see Bundesministerium für Gesundheit, 2025) and excluded all participants that were surveyed for the GHS measurement after this date in order to get a clear "before" value. This left us with a sample of $N = 2884$ participants who had completed the GHS Follow-up 4 assessment before the onset of the pandemic and therefore provided a clearly defined pre-pandemic baseline (T0). After excluding participants with missing data on the childhood trauma screener, the final sample comprised $N = 2744$ individuals.

2.2. Measures

Sociodemographic information comprised participants' age, gender, living situation, marital status, partnership status, and vocational status. Socioeconomic status was calculated according to (Lampert et al., 2013). Cardiovascular risk factors (CVRFs) and comorbidities such as diabetes, obesity, hypertension, coronary artery disease (CAD), chronic-obstructive pulmonary disease (COPD), and cancer were assessed by asking the respondents if they were diagnosed at any point in their life with either illness.

2.3. The study also used a range of validated instruments

Depression symptoms were captured via self-report by employing the depression module of the Patient Health Questionnaire. Its originally nine items assess core symptoms of major depressive disorder in line with the established diagnostic criteria of the DSM-5. In this study, it was used as the PHQ-8 and the suicidal ideation item was evaluated separately. For the last two weeks, participants responded to questions about changes in terms of their sleep, eating habits, self-criticism, level of interest, ability to concentrate, energy, feeling down or depressed, as well as passive death wishes/thoughts of harming themselves on a four-point Likert-type scale. Response options range from 0 ("not at all") to 3 ("nearly every day"). The scores of the individual items form the sum score. Previous research has attested to the PHQ-9's (Kocalevent et al., 2013; Kroenke et al., 2001; Löwe et al., 2004) and PHQ-8's (Spangenberg et al., 2012) good reliability and validity. A score of 0–4 indicates minimal or no depression, 5–9 signifies mild depression, 10–14 represents moderate depression, 15–19 indicates moderately severe depression, and 20–24 denotes severe depression.

The single suicidal ideation item was coded in a binary manner in keeping with previous procedures (e.g., Otten et al., 2022), so that the response option 0 remained 0, indicating the absence of suicidal ideation; and response options 1–3 were grouped together to indicate the presence of suicidal ideation (irrespective of frequency). The item has previously shown its reliability and validity, for example, it was predictive of suicidal behavior (Louzon et al., 2016).

Anxiety symptoms were assessed via self-report, as well, using the Generalized Anxiety Disorder 2-item (GAD-2) (Kroenke et al., 2007). The GAD-2 is a brief screening tool used to identify probable cases of generalized anxiety disorder consisting of two items that ask respondents how often, over the last two weeks, they have been bothered by feelings of nervousness, anxiety, or being on edge, and by an inability to stop or control worrying. Each item is scored from 0 ("not at all") to 3 ("nearly every day"), resulting in a total score ranging from 0 to 6 with higher scores indicating greater severity of anxiety symptoms.

Loneliness was self-reported by participants on the UCLA 3-item loneliness scale (Klein et al., 2021; Richter and Weinhardt, 2014). It is a concise, indirect measure (meaning it does not include the word "loneliness") designed to assess subjective feelings of loneliness. Derived from the longer-form Revised UCLA Loneliness Scale with 20 items (Russell et al., 1980), it consists of three items that ask for the frequency

of feeling a lack of companionship, feeling left out, and feeling isolated from others. Participants respond to each item on a 5-point Likert-type scale ranging from 0 ("never") to 4 ("very often"), resulting in a total score ranging from 0 to 12, with higher scores indicating greater loneliness. The scale has been validated in various population-based studies, demonstrating satisfactory internal consistency (Cronbach's α = 0.82) (Ernst et al., 2023), measurement invariance with respect to age and gender (Klein et al., 2021), and significant associations with measures of depression and other loneliness measures (Reinwarth et al., 2023).

Abuse and neglect suffered while growing up were assessed using the Childhood Trauma Screener (CTS) (Glaesmer et al., 2013; Witt et al., 2022). The CTS is a brief assessment of emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect with five items in total. Respondents rate the frequency of each experience on a scale from 0 ("never true") to 4 ("very often true"), with higher scores indicating greater frequency and severity of trauma exposure. Cut-off values are used to categorize the extent of childhood trauma, allowing to indicate for each subtype whether participants suffered "significant" exposure. They were "often true" for emotional and physical neglect, "sometimes true" and "often true" for emotional abuse and physical abuse, and "rarely true" for sexual abuse. The CTS has shown good correspondence with the longer-form Childhood Trauma Questionnaire (CTQ) (Bernstein et al., 2003; Klinitzke et al., 2012) it was derived from (Glaesmer et al., 2013).

We used the Brief Social Support Scale (BS6) to assess social support (Beutel et al., 2017). The six-item instrument assesses two key dimensions of social support, emotional-informational (such as having someone to confide in) and tangible support (such as having help with daily chores), which can also be added to create a sum score. It uses a four-point Likert scale response format for each of its six items. Participants are asked to rate how often someone is available to provide the specified type of support, with response options ranging from "1 = never" to "4 = always". The BS6 demonstrated strong psychometric properties, with good internal consistency for the full scale (α = 0.86) in the validation study (Beutel et al., 2017). The validation process confirmed the scale's reliability and its relevance to both mental and physical health outcomes, showing that lower social support was associated with higher levels of distress and health issues.

Social phobia was assessed using the German version of the Mini-Social Phobia Inventory (Mini-Spin) (Connor et al., 2001; Wiltink et al., 2017). Its three items describe behavior of avoidance and fear of embarrassment. Respondents are asked to score each item on a 5-point Likert scale with options ranging from "0 = not at all" to "4 = extremely". A cut-off score of 6 showed good sensitivity (89 %) and specificity (90 %) (Wiltink et al., 2017) in detecting individuals with social phobia. Within the same validation study, its internal consistency was good (α = 0.80).

2.4. Statistical analyses

To examine changes in mental distress symptoms and loneliness over time, analyses of variance (ANOVAs) were conducted. These analyses did not only test changes over time, but whether they differed according to participants' trauma exposure. To this aim, we distinguished three groups (in line with previous research), i.e., those reporting no, one to two, and three or more types of childhood trauma. In addition, because the outcome variables were not normally distributed and one of the trauma groups was relatively small, non-parametric tests were performed to account for these distributional issues and to provide robustness checks.

In addition, multiple linear regression models and logistic regression models were used to investigate the relevance of childhood trauma for changes in mental distress symptoms and loneliness in a more nuanced way. These models were operationalized as structural equation models (SEMs) so that missing values could be imputed using the "fiml" (full estimation maximum likelihood) estimation, counteracting losses in power. Prior to the estimation of the models, we calculated correlations with depression, anxiety, loneliness, and suicidal ideation in order to gain insight on which variables to include as potential confounders or covariates. None of the correlations were so high as to suggest difficulties in terms of multicollinearity (the highest being 0.131 for BS6 and 0.134 for Mini-Spin, both for the difference in loneliness scores).

For the regression models, we opted for stepwise adjustment. The first model, therefore included only age and gender. The second model additionally tested for associations with the aforementioned trauma groups based on the CTS. The third and final model additionally included employment, social support, and social anxiety. Changes between T1 and T2 in depressiveness, anxiety, loneliness, and suicidal ideation at any time during the pandemic served as dependent variables, respectively. In line with established conventions, the level of significance was set as $p < .05$. All analyses were conducted using R (version 2023.12.1, packages: dplyr, psych, lavaan, lm.beta).

3. Results

3.1. Sample characteristics

The sample consisted of 2744 participants with a balanced gender distribution (49.5 % women). Their details are shown in Table 1. At the GCS Baseline assessment, the mean age was 61.25 (*SD* = 12.17). In terms of educational attainment, the largest group (40.5 %) had an academic secondary school degree (Abitur). Almost two-thirds (60.8 %) of participants were currently employed, and 76.2 % reported being in a partnership and living together. The mean equivalized income among the participants was 3038.22 € (*SD* = 1972.16 €).

In terms of mental health, the average score for depression symptoms (PHQ-8) was in the subclinical range, but with substantial heterogeneity, with a mean of 3.89 (*SD* = 3.38). Of the total sample, 4.2 % reported suicidal ideation. Chronic conditions and comorbidities were prevalent in the sample: 9.8 % had diabetes, 23.0 % were obese, 60.0 % had hypertension, 4.4 % had CAD, 7.4 % had COPD, and 17.0 % had cancer. Additionally, 13.0 % had a history of depression, and 7.8 % had a history of anxiety.

Suppl. Table 1 depicts the raw scores of symptoms over the four measurement points. As there were no substantial differences between the measurement points throughout the pandemic, they were summarized as a "GCS mean" which was used to ease comparisons in the following analyses. However, stable differences regarding the overall symptom levels were observed in conjunction with participants' exposure to child maltreatment (i.e., significant dimensions as reported on the CTS). Figs. 1–4 show symptom trajectories over all measurement points for participants of the separate trauma groups, ranging from no exposure to three and more types. In all cases - for depression symptoms, anxiety symptoms, loneliness, and suicidal ideation - values are higher among those reported more trauma.

3.2. Main analyses

3.2.1. ANOVAs and Kruskal-Wallis-tests

The ANOVAs are presented in Suppl. Table 2. Their results indicated significant changes over time for depression (PHQ-8), loneliness (UCLA-3), anxiety (GAD-2), and suicidal ideation.

There was a main effect of trauma exposure in the sense that those with more types of significant abuse and neglect in their past had higher anxiety symptom levels overall. However, participants' trauma exposure did not interact with the time variable in predicting the level of anxiety symptoms. That is, anxiety levels differed between the trauma groups in absolute terms, but the pattern of change from the pre-pandemic baseline to the pandemic assessments was comparable across all groups in the full sample.

Second, the ANOVA results indicated a significant overall increase of depression scores over time, with a small effect size. Again, more

Table 1
Participant characteristics at the pre-pandemic baseline.

	Available data	Descriptive results	α	ω
	N = 2744			
Sociodemographic information				
Gender (female, %)	2744	1369 (49.9 %)		
Age groups (%)	2744	61.99 (11.74)		
25–34		60 (2.2 %)		
35–44		133 (4.9 %)		
45–54		525 (19.1 %)		
55–64		845 (30.8 %)		
65–74		747 (27.2 %)		
75+		434 (15.8 %)		
Education (%)	2734			
No degree		6 (0.2 %)		
Secondary general school degree (Hauptschule)		613 (22.4 %)		
Secondary school degree (Realschule)		711 (26.0 %)		
Academic secondary school degree (Abitur)		1086 (39.7 %)		
Vocational school (Fachabitur)		318 (11.7 %)		
Employment (%)	2442			
No current employment		1001 (41.0 %)		
Irregularly employed		149 (6.1 %)		
Part-time		384 (15.7 %)		
Fulltime		908 (37.2 %)		
Partnership (%)	2082			
No partnership		352 (16.9 %)		
Partnership but living separately		147 (7.1 %)		
Partnership and living together		1583 (76.0 %)		
Equivalized income (mean)	2556	3033.49 (1953.40)		
SES (mean)	2559	14.61 (4.17)		
Mental health and distress				
Depression PHQ-8 (mean)	2518	3.88 (3.38)	0.82	0.85
Suicidal ideation (%)	2578	113 (4.4 %)		
Loneliness UCLA (mean)	2498	3.29 (2.28)	0.77	0.79
Anxiety GAD-2 (mean)	1403	0.72 (1.03)	0.74	
Social phobia mini-SPIN (mean)	2727	2.01 (1.84)	0.76	0.76
Childhood Trauma (stratified by groups)				
0	2744	1759 (64.1)		
1–2		881 (32.1)		
3+		104 (3.8)		
Social Support BS6 (mean)	2513	14.80 (3.79)	0.90	0.95
Resilient Coping BRCS (mean)	2516	10.83 (3.19)	0.78	0.82
Physical illnesses and comorbidities				
CVFRs & comorbidities				
Diabetes (%)	2742	273 (10.0 %)		
Obesity (%)	2744	625 (22.8 %)		
Hypertension (%)	2738	1683 (61.5 %)		
CAD (%)	2734	130 (4.8 %)		
COPD (%)	2744	205 (7.5 %)		
Cancer (%)	2741	472 (17.2 %)		
History of depression (%)	2739	369 (13.5 %)		
History of anxiety (%)	2739	221 (8.1 %)		

Table legend: SES = socioeconomic status, CVRFs = cardiovascular risk factors, CAD = coronary artery disease, COPD = chronic obstructive pulmonary disease.

experiences of abuse and neglect were associated with more symptoms overall; but there was no interaction effect, indicating that trauma exposure had no bearing on the increase in symptoms participants experienced during the pandemic.

Regarding the mean sum scores of loneliness, there was an increase over time with a moderate effect size. In this model, having suffered more abuse and neglect was again associated with higher levels of loneliness in general. In addition, there was a trend for diverging changes over time as a function of participants' trauma exposure. This is also visible in Fig. 3, which shows steeper increases in loneliness for the participants reporting comparatively fewer instances of childhood trauma; however, at the later measurement point, their overall loneliness levels are still lower than those of the group reporting the most significant abuse and neglect.

The prevalence of suicidal ideation in our sample also rose significantly. Additionally, the analysis showed a significant main effect of trauma groups in the sense that individuals with higher levels of childhood trauma had higher baseline prevalence rates of suicidal ideation. However, there was no significant interaction between time and trauma groups.

3.2.2. Participants' experiences of abuse and neglect during childhood had varying influences within the separate regression models

For anxiety (Table 2), both gender and age emerged as significant predictors in the basic model, with higher age and female gender being associated with smaller reductions in anxiety scores. When trauma exposure was added in Model 2, age remained a significant predictor, whereas trauma exposure itself was not. In the final model, only social anxiety showed a significant association, predicting smaller changes in anxiety symptoms.

For depression (Table 3), in the basic model, gender was a significant predictor of changes in depression scores and it remained significant after adding the trauma variable in model 2. The positive regression coefficient indicates that women showed greater increases in depression scores than men. However, in the final model 3, it fell short of significance. The full model showed that part-time (compared to regular) employment was significantly associated with greater increases in depression scores, while more social support was significantly associated with lower increases. Higher social anxiety was also associated with lower increases. Trauma exposure played no role.

The models of increases in loneliness are presented in Table 4. In the baseline model, gender was a relevant predictor, so that women experienced stronger increases in loneliness, and it stayed relevant after adding the trauma variable in model 2, which also was related to increases in loneliness. Both variables stayed relevant in the final, fully adjusted model in the sense that female gender was related to stronger increases in loneliness, and the most severe trauma exposure (compared to none) was associated with smaller increases, as were more social anxiety and more social support.

Predictors of changes in suicidal ideation are shown in Table 5. Neither the basic model including only gender and age nor the next model including the trauma variable demonstrated a significant predictor of changes in suicidal ideation. Finally, the inclusion of social support and social anxiety significantly improved the model. High social support reduced the risk of increased suicidal ideation, whereas high social anxiety increased the risk.

4. Discussion

This study harnessed a large, prospective community cohort to investigate the differential impact of the COVID-19 pandemic on mental health outcomes. The aim was to examine whether pre-existing vulnerabilities, specifically a history of childhood abuse and neglect, predicted differential changes in mental health across the COVID-19 pandemic. We thus investigated it as a stable, pre-pandemic risk factor that may shape individuals' psychological responses to a major societal stressor. By analysing true pre-pandemic baseline data and repeated follow-ups collected during the pandemic, we were able to test whether early adversity moderated within-person changes in depression, anxiety, loneliness, and suicidal ideation over time.

Unsurprisingly, individuals with higher levels of childhood trauma generally exhibited greater overall mental distress, including depression, anxiety, and loneliness. This severity-related association of childhood trauma and negative mental health outcomes has previously been

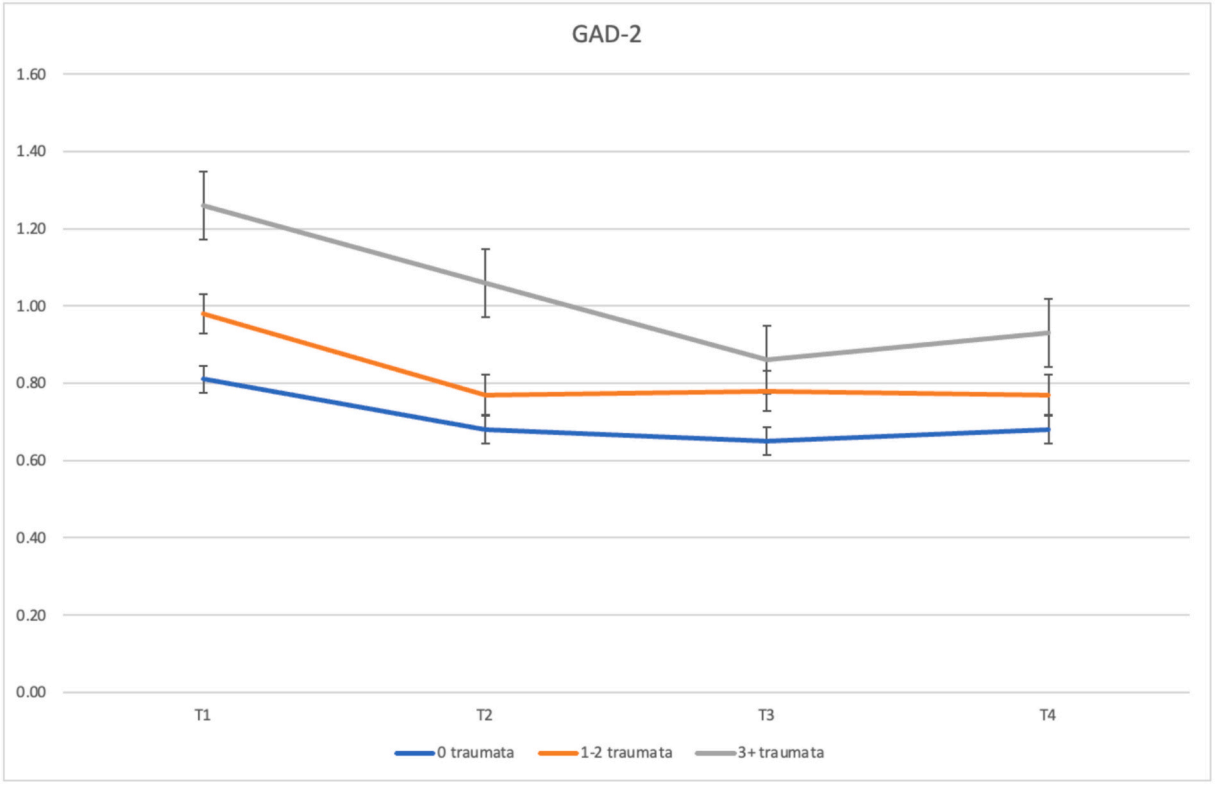

Fig. 1. Changes in anxiety over the course of the pandemic, stratified by the extent of childhood trauma. The figure shows changes in anxiety stratified by the presence of childhood abuse and neglect (distinguishing participants reporting no trauma, one to two types of trauma, and three or more).

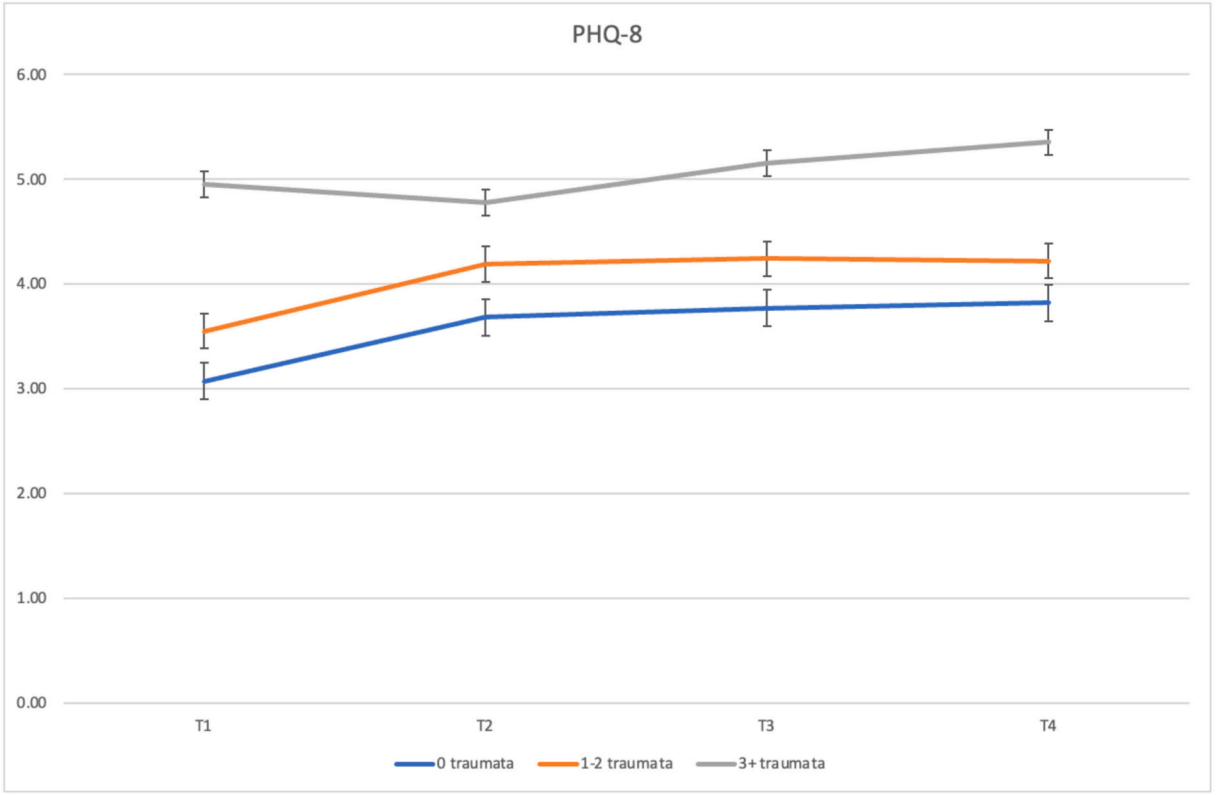

Fig. 2. Changes in depression symptoms over the course of the pandemic, stratified by the extent of childhood trauma. The figure shows changes in depression stratified by the presence of childhood abuse and neglect (distinguishing participants reporting no trauma, one to two types of trauma, and three or more).

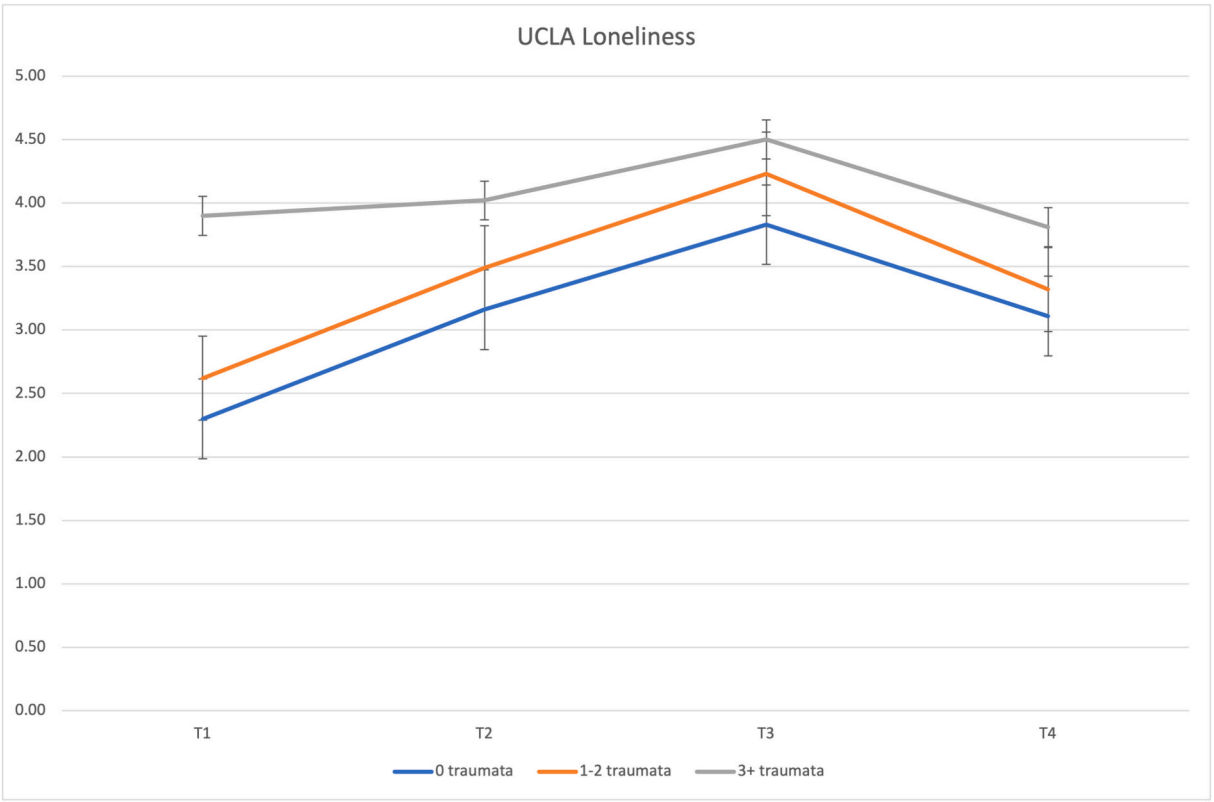

Fig. 3. Changes in loneliness over the course of the pandemic, stratified by the extent of childhood trauma. The figure shows changes in loneliness stratified by the presence of childhood abuse and neglect (distinguishing participants reporting no trauma, one to two types of trauma, and three or more).

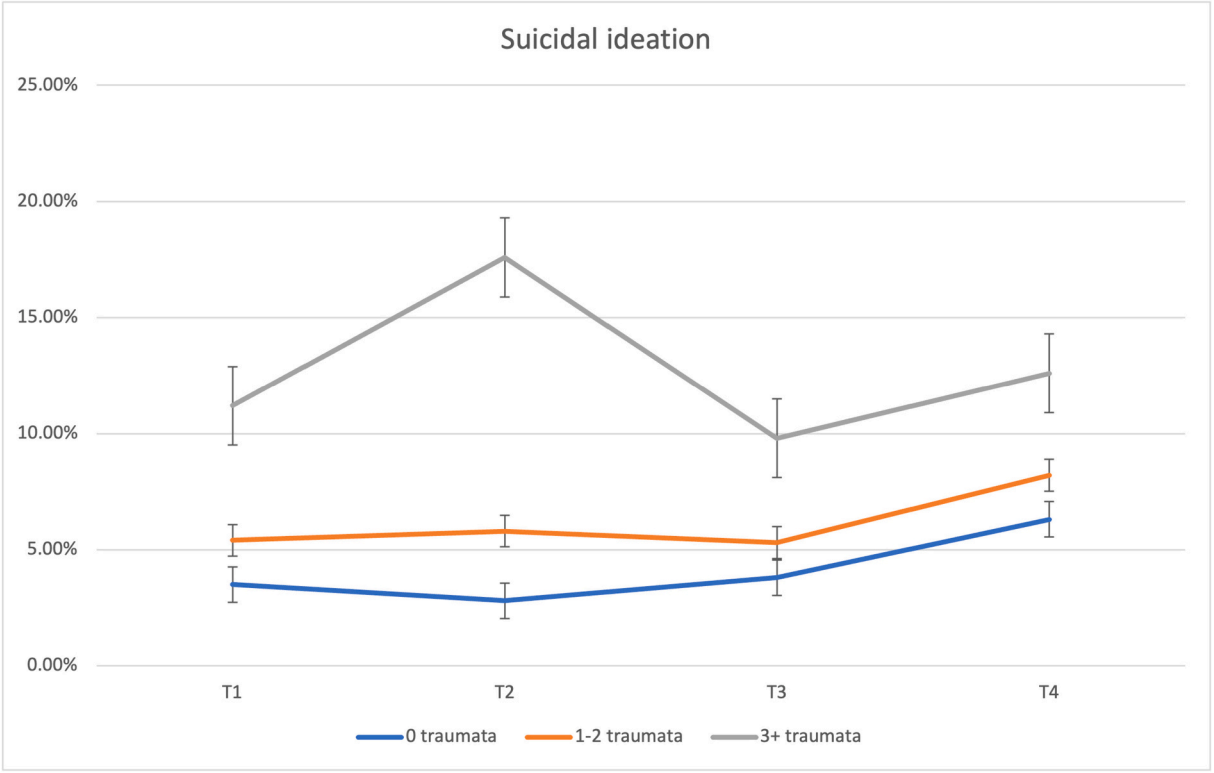

Fig. 4. Changes in the presence of suicidal ideation over the course of the pandemic, stratified by the extent of childhood trauma. The figure shows changes in the frequency of suicidal ideation stratified by the presence of childhood abuse and neglect (distinguishing participants reporting no trauma, one to two types of trauma, and three or more).

Table 2
Multiple linear regression analyses for anxiety, depression, and loneliness (Outcome: difference between pre-pandemic and summarized Pandemic T1-T3 scores).

Model	Fit	B	95 % CI	P
Model 1:	$N = 1345$ $F(2, 1342) = 5.711$, $p = .003$ $R^2 = 0.008$; $R^2_{adj.} = 0.007$			
Gender (ref.: male)		−0.103	−0.201 to −0.005	**0.040**
Age		0.004	0.001–0.008	**0.020**
Model 2:	$N = 1345$ $F(4, 1340) = 4.614$, $p = .001$ $R^2 = 0.014$; $R^2_{adj.} = 0.011$			
Gender (ref.: male)		−0.093	−0.192–0.005	0.063
Age		0.005	0.001–0.009	**0.008**
Childhood trauma (ref.: 0)				
1–2		−0.070	−0.179–0.038	0.205
3+		−0.321	−0.640 to −0.002	**0.049**
Model 3:	$N = 1226$ $F(9, 1216) = 2.888$, $p = .002$ $R^2 = 0.021$; $R^2_{adj.} = 0.014$			
Gender (ref.: male)		−0.095	−0.203–0.014	0.088
Age		0.003	−0.002–0.009	0.218
Childhood trauma (ref.: 0)				
1–2		−0.052	−0.168–0.064	0.379
3+		−0.266	−0.603–0.072	0.122
Employment (ref.: no employment)				
Irregular		0.130	−0.042–0.303	0.139
Part-time		−0.003	−0.189–0.183	0.976
Fulltime		−0.019	−0.172–0.135	0.813
BS6 (social support)		−0.008	−0.023–0.007	0.292
Mini-spin (social anxiety)		−0.041	−0.075 to −0.007	**0.017**

Bold type indicates statistically significant predictors.

Table 3
Multiple linear regression for depression (Outcome: difference of PHQ-8 between pre-pandemic and summarized Pandemic T1-T3 scores).

Model	Fit	B	95 % CI	P
Model 1:	$N = 2321$ $F(2, 2318) = 4.707$, $p = .009$ $R^2 = 0.004$; $R^2_{adj.} = 0.003$			
Gender (ref.: male)		0.207	0.017–0.397	**0.033**
Age		−0.008	−0.017–0.001	0.067
Model 2:	$N = 2321$ $F(4, 2316) = 3.576$, $p = .006$ $R^2 = 0.006$; $R^2_{adj.} = 0.004$			
Gender (ref.: male)		0.222	0.031–0.414	**0.022**
Age		−0.008	−0.017–0.001	0.083
Childhood trauma (ref.: 0)				
1–2		0.027	−0.191–0.246	0.806
3+		−0.557	−1.086 to −0.028	**0.039**
Model 3:	$N = 2,086$ $F(9, 2076) = 5.408$, $p < .001$ $R^2 = 0.023$; $R^2_{adj.} = 0.019$			
Gender (ref.: male)		0.217	−0.002–0.436	0.052
Age		−0.006	−0.019–0.008	0.418
Childhood trauma (ref.: 0)				
1–2		0.093	−0.135–0.321	0.422
3+		−0.442	−1.034–0.150	0.143
Employment (ref.: no employment)				
Irregular		0.130	−0.285–0.545	0.539
Part-time		0.432	0.082–0.781	**0.016**
Fulltime		0.255	−0.062–0.573	0.115
BS6 (social support)		−0.068	−0.100 to −0.036	**<0.001**
Mini-spin (social anxiety)		−0.084	−0.149 to −0.019	**0.011**

Bold type indicates statistically significant predictors.

reported based on representative population surveys (Ernst et al., 2022a, 2022b; Hughes et al., 2017; Krakau et al., 2021) as well as in clinical samples (Gemke et al., 2024).

However, looking closer at *changes* within the pandemic context, it was interesting to see that the different symptoms/complaints changed in different ways. While anxiety decreased slightly in the total sample, all other indices (depression symptoms, loneliness, and suicidal ideation) went up. This could be interpreted in the context of the evolving pandemic situation, particularly the impact of the availability of vaccinations and ongoing public health measures. As vaccines became available and more widely administered, they likely provided a sense of relief and safety to the population, reducing fears related to contracting the virus and concerns about severe illness or death. Such effects could in particular apply to older rather than younger individuals who were at a higher risk for death and severe courses of the illness, such as the participants of the present study. This interpretation is in line with previous evidence showing a greater willingness to be vaccinated among older individuals, including those with pre-existing physical illness (Hettich et al., 2021). The newfound sense of protection could have alleviated some of the acute anxiety that was prevalent earlier in the pandemic when uncertainty and fear of infection were at their peak. Initially high and then falling levels of anxiety were also observed in other longitudinal studies (Bendau et al., 2021; Hettich et al., 2022). Furthermore, there is evidence for more stable mental health and quality of life among older compared to younger individuals in the context of the pandemic (Beutel et al., 2021; Hettich-Damm et al., 2023).

That we did not see the same trend, but instead rises in loneliness and depression, could be due to the prolonged nature of the pandemic and the continued social restrictions. Even with the availability of vaccines, many public health measures, such as social distancing, remote working, and limits on social gatherings, remained in place to varying degrees. These restrictions likely contributed to sustained feelings of isolation and disconnection from social support networks, exacerbating feelings of loneliness and despair. Moreover, the prolonged duration of the pandemic could have led to a cumulative toll on mental health, where the initial resilience people might have begun to wear down, resulting in increased depressive symptoms and hopelessness. The ongoing economic and social disruptions, uncertainty about the future, and potential grief from losses experienced during the pandemic might have further intensified these feelings. Other studies have pointed to particularly burdened subgroups whose mental health did not recover as much as others' after the initial phase of the pandemic was over, but instead showed a delayed spike in distress (Ahrens et al., 2021).

Furthermore, the higher level of symptoms according to the degree of participants' exposure to abuse and neglect during childhood was maintained during the COVID-19 pandemic. Notably, social support and social anxiety played significant roles in predicting changes in mental health outcomes. Higher social support was associated with smaller increases in depression and suicidal ideation, while higher social anxiety was linked to comparatively smaller increases in loneliness and anxiety.

Table 4
Multiple linear regression for loneliness (Outcome: difference of UCLA between Pre-pandemic and summarized Pandemic T1-T3 scores).

Model	Fit	B	95 % CI	P
Model 1:	$N = 2305$ $F(2,2302) = 13.910$, $p < .001$ $R^2 = 0.012$; $R^2_{adj.} = 0.011$			
Gender (ref.: male)		0.442	0.275–0.608	**<0.001**
Age		−0.001	−0.008–0.007	0.825
Model 2:	$N = 2305$ $F(4, 2300) = 11.721$, $p < .001$ $R^2 = 0.020$; $R^2_{adj.} = 0.018$			
Gender (ref.: male)		0.468	0.302–0.635	**<0.001**
Age		0.000	−0.007–0.008	0.908
Childhood trauma (ref.: 0)				
1–2		−0.066	−0.251–0.118	0.482
3+		−1.001	−1.591 to −0.411	**0.001**
Model 3:	$N = 2077$ $F(9, 2067) = 8.170$, $p < .001$ $R^2 = 0.034$; $R^2_{adj.} = 0.030$			
Gender (ref.: male)		0.476	0.288–0.663	**<0.001**
Age		−0.003	−0.014–0.008	0.611
Childhood trauma (ref.: 0)				
1–2		−0.023	−0.217–0.170	0.812
3+		−0.885	−1.511 to −0.260	**0.006**
Employment (ref.: no employment)				
Irregular		−0.193	−0.567–0.180	0.310
Part-time		0.004	−0.292–0.300	0.977
Fulltime		−0.110	−0.370–0.151	0.409
BS6 (social support)		0.028	0.003–0.054	**0.032**
Mini-spin (social anxiety)		−0.102	−0.154 to −0.050	**<0.001**

Bold type indicates statistically significant predictors.

Table 5
Logistic regression (Outcome: Incident suicidal ideation at Pandemic T1).

Model	Fit	OR	95 % CI	P
Model 1:	$N = 2550$ McFadden $R^2 = 0.001$ Cox & Snell $R^2 = 0.001$ Nagelkerke $R^2 = 0.001$			
Gender (ref.: male)		0.866	0.639–1.175	0.356
Age		1.005	0.992–1.018	0.496
Model 2:	$N = 2550$ McFadden $R^2 = 0.002$ Cox & Snell $R^2 = 0.001$ Nagelkerke $R^2 = 0.003$			
Gender (ref.: male)		0.873	0.643–1.184	0.383
Age		1.004	0.990–1.017	0.596
Childhood trauma (ref.: 0)				
1–2		1.172	0.847–1.622	0.339
3+		0.773	0.306–1.948	0.584
Model 3:	$N = 2260$ McFadden $R^2 = 0.203$ Cox & Snell $R^2 = 0.111$ Nagelkerke $R^2 = 0.252$			
Gender (ref.: male)		0.749	0.519–1.080	0.122
Age		1.010	0.989–1.031	0.368
Childhood trauma (ref.: 0)				
1–2		1.083	0.752–1.559	0.667
3+		0.403	0.122–1.327	0.135
Employment (ref.: no employment)				
Irregular		1.575	0.831–2.983	0.163
Part-time		1.299	0.717–2.353	0.389
Fulltime		1.036	0.611–1.756	0.897
BS6 (social support)		0.907	0.873–0.942	**<0.001**
Mini-spin (social anxiety)		1.209	1.110–1.317	**<0.001**

Bold type indicates statistically significant predictors.

The present work is in line with other empirical observations that underscored the heterogeneity in mental health changes in the pandemic context. By investigating differential trajectories of individuals with different early interpersonal experiences, it contributes to a better understanding of this diversity. This study underscores childhood trauma as a risk factor for mental health in the pandemic context; and shows that it is important to consider *overall* levels of distress as well as within-person changes. Along these lines, when zeroing in on the prediction of change scores, some associations may at first seem paradoxical, as there were instances in which markers of "risk" in normal times (such as social anxiety symptoms) were associated with smaller increases, e.g., in loneliness scores. Social restrictions such as having fewer contacts, and face-to-face interactions while wearing masks, could have provided measures of relief to those with a high level of social anxiety, or those with insecure attachment/negative expectations toward others, respectively, shaped by childhood adversity. However, these vulnerable individuals already had high levels of depression and loneliness to begin with, which could constitute a trade-off of such avoidant patterns of attachment hindering individuals from entering close social contacts (Ernst et al., 2024; Mikulincer et al., 2021).

Thus, the present findings highlight the need to contextualize "risk"/"protective" factors (also see Kraemer et al., 1997). While having suffered adverse childhood experiences has consistently been associated with comparatively more mental distress and disorders (Hughes et al., 2017), in this study, individuals with more experiences of abuse and neglect in the past reported smaller increases in loneliness than others, and the prevalence of suicidal ideation did not increase as much among them compared to the other participant groups either.

With respect to changes in loneliness, previous studies have also reported somewhat surprising predictors of changes in the pandemic context (Entringer and Gosling, 2021): By way of example, extraversion is "normally" thought of as protective against loneliness, however, in the pandemic context, it conferred risk for higher increases in loneliness. Different social needs and changes in introverted and extroverted participants' social lives may explain this observation.

Given the established relationship between childhood trauma and social isolation and loneliness in normal times (de Heer et al., 2024), there might be a parallel here in the sense that people with more ACEs suffered comparatively smaller increases in loneliness during the pandemic because their baseline levels were already elevated. However, the interaction plots highlight how important it is to also take account of overall levels of distress as in the case of loneliness, the groups less affected by trauma experienced significant increases, however, they still remained *below* the *baseline* loneliness level of the most traumatized at the later measurement point. Beyond higher severity and pervasiveness of mental illness, individuals with trauma histories are at higher risk for relapse (Nanni et al., 2012; Nelson et al., 2017). They are less likely to achieve stable full remission in evidence-based standard treatments (Kuzminskaite et al., 2022, 2023) and may require longer, more

intensive therapies. Given the high pressure in mental health care services due to the overall increased need, childhood trauma histories are a relevant factor for treatment stratification and resource allocation (Lina Krakau et al., 2024). This is further reinforced by our findings, showing that traumatized individuals did suffer from increases in mental distress during the pandemic. Given their already higher baseline distress levels, their distress may push them (a new) into an episode of mental disorder.

4.1. Strengths and limitations

A significant strength of our study is the inclusion of genuine pre-pandemic baseline data within our sample. This allows us to analyze changes throughout the pandemic on a robust foundation, providing a clearer understanding of the shifts in mental health outcomes.

In interpreting our findings, several methodological considerations deserve attention. First, while we adjusted for sociodemographic variables such as educational attainment and socioeconomic status to isolate the unique contribution of childhood adversity, it is important to acknowledge that these variables may not function as classical confounders. Rather, they can represent downstream consequences of childhood adversity. In causal inference frameworks, adjusting for such post-exposure variables may lead to an underestimation of the total effect of the exposure (so-called "overadjustment bias"). Therefore, the present findings might reflect conservative estimates of the actual impact of childhood trauma on mental health changes during the pandemic.

Second, selection bias may have influenced the observed associations. Individuals with more severe trauma histories and higher psychological burden might have been less likely to participate in longitudinal studies due to mental health-related impairments or avoidance tendencies. As a result, the study sample may represent a psychologically healthier subset of the population, potentially leading to an underestimation of the true effects of childhood adversity. Future research should consider designs that better account for such biases, including studies that incorporate parent-related variables (e.g., parental mental health) as potential confounders and use weighting or sensitivity analyses to address selective dropout or non-response.

Further, our sample is characterized by a relatively older demographic. Many studies have indicated that younger individuals experienced significant increases in distress during the pandemic, a trend that our sample may not adequately capture due to its age composition. While we also discuss the potential relevance of increasing vaccine availability for interpreting temporal trends, particularly decreasing anxiety, this study did not explicitly examine factors such as vaccination status, timing, or perceptions of protection. Thus, the interpretation linking mental health changes to vaccination processes should be viewed as tentative.

Lastly, childhood trauma was assessed via self-report. Although this procedure has been confirmed to be valid (Hardt and Rutter, 2004), it could not be supplemented by objective data within the context of this study; and the longitudinal study design only concerned several years in adulthood, not participants' whole life span.

5. Conclusions

This study provides a comprehensive analysis of the differential impact of the COVID-19 pandemic on various mental health outcomes, particularly focusing on individuals with and without experiences of childhood abuse and neglect. Our findings highlight the complexity of mental health trajectories during the pandemic, revealing that while anxiety levels slightly decreased, other mental health indices, such as depression, loneliness, and suicidal ideation, showed significant increases over time. The presence of childhood trauma was associated with higher baseline levels of mental distress across all indices and while temporal trends in the childhood trauma group paralleled those participants unaffected by childhood trauma, their higher levels were maintained over the course of the pandemic.

Our study also identified significant protective factors, such as social support, which was found to mitigate increases in depression and suicidal ideation. Conversely, and perhaps counterintuitively, higher levels of social anxiety were associated with smaller increases in loneliness and anxiety, suggesting that individuals with pre-existing social fears may have experienced less disruption in their social lives due to pandemic-related restrictions. These findings emphasize the need for targeted mental health interventions that consider both pre-existing vulnerabilities and unique, current stressors, especially in the context of collective crises such as a pandemic.

CRediT authorship contribution statement

Mareike Ernst: Writing – original draft. **Julia Petersen:** Writing – original draft, Visualization, Methodology, Investigation. **Lina Krakau:** Writing – review & editing. **Anna C. Reinwarth:** Writing – review & editing. **Nora Hettich-Damm:** Writing – review & editing. **Alica Hartmann:** Writing – review & editing. **Philipp S. Wild:** Writing – review & editing. **Thomas Münzel:** Writing – review & editing. **Michael S. Urschitz:** Writing – review & editing. **Karl Lackner:** Writing – review & editing. **Norbert Pfeiffer:** Writing – review & editing. **Manfred E. Beutel:** Writing – review & editing.

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Declaration of competing interest

The authors have no conflict of interest to report.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jad.2025.120907.

Data availability

Written consent from GCS study participants does not allow public access to the data. Access to the data in the local database is possible at any time upon request according to the ethics vote. This concept was developed with the local data protection officer and the ethics committee (local ethics committee of the Rhineland-Palatinate Medical Association, Germany). Interested scientists can make their requests to the Gutenberg COVID-19 Study Steering Committee (E-Mail: info-gcs@unimedizin-mainz.de).

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