

Research Report

Context Matters: Health Sensitivity in the Daily Lives of Older Adults Living Through the COVID-19 Pandemic

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Abstract

Objectives: Throughout 2021, the coronavirus disease (COVID-19) pandemic caused renewed restrictions across Germany. Given the growing evidence that the pandemic negatively affects older adults' health and well-being, this study investigated health sensitivity (emotional reactions to momentary health challenges) and its moderators (age, morbidity, perceived COVID-19 risks and worries) among older adults in their everyday lives during the second and third waves of the pandemic.

Methods: Multilevel models were applied to self-reported momentary health and affect data, collected 6 times per day across 7 consecutive days in 104 participants ($M_{\text{age}} = 76.35$; range: 67–88 years), assessed between April and June 2021 (~300,000 COVID-19 cases in Germany at the time).

Results: Health sensitivity was unrelated to age and lower with higher morbidity. Importantly, older adults showed higher health sensitivity in moments when they also perceived a greater risk of contracting COVID-19.

Discussion: Findings suggest that sociocontextual factors related to the pandemic modulate emotional reactions to momentary health challenges, thereby underscoring the consequences of COVID-19 for older adults' emotional experiences.

Keywords: Affective reactivity, COVID-19, Physical health

Psychological functioning both reflects and influences the contexts people are living in (Bronfenbrenner, 1977). Throughout the first half of 2021, the second and third waves of the coronavirus disease (COVID-19) pandemic caused governments to extend restrictive measures. Among the unwanted corollaries, levels of psychological distress (Elsayed et al., 2022) and pandemic-specific worries (Nelson & Bergeman, 2021) were elevated in older populations. However, little is known about whether such COVID-19 stressors shaped other life domains. For example, health sensitivity (how receptive people's effect is to perturbations in physical health) has been shown to be associated with

increased mortality (Schöllgen et al., 2016). Although there may be many contexts in which health sensitivity has beneficial outcomes (e.g., sensitivity to symptoms might imply earlier treatment), this highlights the harmful consequences it can have (see Potter, Gerstorf, et al., 2022, for a full discussion). It thus appears pivotal to understand the factors influencing health sensitivity during the pandemic.

Health Sensitivity in Older Adults' Daily Life

The strengths and vulnerability integration model (Charles, 2010) maintains that potentially beneficial age effects (e.g.,

lower health sensitivity) diminish in circumstances where stress is prolonged and inescapable, such as the COVID-19 pandemic. Indeed, the pandemic poses a protracted risk to older adults' health and well-being (Hu et al., 2021) that might undermine their otherwise enhanced emotion regulation abilities (see Carstensen et al., 2020), thereby attenuating beneficial (pre-pandemic) age effects.

The Role of Morbidity

Because emotional reactions to physical symptoms partly depend on past health experience, pre-existing health vulnerabilities might influence health sensitivity. Pre-pandemic studies indicate that higher morbidity is associated with lower health sensitivity, presumably reflecting habituation to symptoms (Potter, Gerstorff, et al., 2022). Although it is possible that a similar pattern might arise here (as participants had been living with COVID-19 for 1 year and because processes of habituation tend to occur even in times of crisis), levels of morbidity were particularly salient during the pandemic because older adults with worse health are more vulnerable to COVID-19, which might make them more (emotionally) sensitive to innocuous fluctuations in health. Indeed, more pre-existing health conditions predict stress and depression during the pandemic (Traunmüller et al., 2020), suggesting that, unlike during pre-pandemic times, morbidity might heighten health sensitivity.

The Role of Perceived COVID-19 Risks and Worries

By 2021, COVID-19 and associated restrictions had not only affected older adults' health but also led to dramatic changes to daily life (e.g., prolonged separation, restrictions to important activities), which may have created a testing-the-limits situation in which older adults' regulative capacities are pushed to the limit (Kliegl et al., 1990), leading to increased emotional reactions to fluctuations in health. Although conceptual accounts maintain that people adapt even in times of crisis and initial evidence indicates that older Germans were more (emotionally) overwhelmed during the first wave of the pandemic (Spring 2020) compared with later waves (e.g., Röhr et al., 2020), initial evidence suggests that perceived COVID-19 risks and worries exacerbate emotional reactions to stress (Nelson & Bergeman, 2021). Taken together, this research indicates that a similar pattern might be detected for emotional reactions to health.

Present Study

This study examined health sensitivity and its moderators (age, morbidity, perceived COVID-19 risks and worries) among older adults living through the pandemic. We expected health sensitivity to be related to older age, but

specify no direction of association as the pandemic may attenuate beneficial age effects. Due to its association with (physical) vulnerability throughout the pandemic, we expected higher morbidity to be linked to higher health sensitivity. Finally, based on evidence that COVID-19 stressors exacerbate emotional reactivity, we expected higher perceived COVID-19 risks and worries to heighten health sensitivity.

Method

We used data from an experience sampling study embedded into the Berlin Aging Study II (BASE-II; Drewelies, Duezel, et al., revised manuscript submitted).

Participants

Of the 140 older adults originally contacted for participation, 36 were excluded due to technical problems. The remaining 104 participants ($M_{\text{age}} = 76.35$; $SD = 3.86$; range = 67–88 years; 41% female) provided on average 39 of 42 observations ($SD = 0.65$; range = 25–42) over 7 days ($M = 7$; $SD = 0.80$). Overall, <3% of the sample reported taking medications linked to symptom fluctuation (e.g., sedatives). Participants included in the analysis showed better perceptual speed than those not included ($d = 0.24$; $p = .030$) but did not differ on other variables.

Procedure

BASE-II participants were eligible for the study if they were (a) 60+ years of age; (b) COVID-19 vaccinated; (c) owned or were familiar with a smartphone; and (d) had the sensory acuity to handle the mobile app and hear the signal that prompted assessment. Each day, participants were presented with six questionnaires at set times (9 a.m., 11 a.m., 1 p.m., 3 p.m., 5 p.m., 7 p.m.) which could be delayed 10–45 min to fit participants' schedules.

Post hoc analyses indicated 0.60–0.70 power to detect medium effects ($d = 0.5$).

Measures

Momentary positive and negative affects

Momentary positive and negative affects were measured with the question "how [affect] are you right now?" on a slider scale (0 = not at all; 100 = strongly). Positive affect (PA) was indicated by seven items (happy, relaxed, interested, satisfied, balanced, stimulated, rested; $\omega = 0.962$), as was negative affect (NA; sad, worried, groggy, frustrated, nervous, jittery, angry; $\omega = 0.973$).

Momentary health

Momentary health was measured with the question "How would you rate your health right now?" on a slider scale (0 = very bad; 100 = very good).

Perceived COVID-19 risk and worries

Perceived risk of contracting COVID-19 was measured with the question “Since the last beep, how likely is it that you have been infected with the coronavirus?” (0 = not likely at all; 100 = very likely). *Worry about COVID-19 affecting one’s health* was measured with the question “Since the last beep, have you been worried about the coronavirus with regard to your own health?” (0 = no worries at all; 100 = very worried). *Worry about COVID-19 affecting a loved one’s health* was measured with the question “Since the last beep, have you been worried about the coronavirus with regard to the health of people who are close to you?” (0 = no worries at all; 100 = very worried).

Covariates

Analyses include relevant variables: education, perceptual speed, morbidity, neuroticism, and momentary stress (see Kroencke et al., 2020). Education was measured in years. *Perceptual speed* was assessed between 2018 and 2020 with the Digit Symbol Test (Wechsler, 1955). *Morbidity* was assessed between 2018 and 2020 as the weighted number of self-reported/physician-diagnosed medical diagnoses on an 11-item checklist largely based on categories from the Charlson index (see Meyer et al., 2016). *Neuroticism* was assessed between 2018 and 2020 with the German short version of the Big Five Inventory (Gerlitz & Schupp, 2005), which includes three neuroticism items answered on a 7-point scale (1 = strongly disagree; 7 = strongly agree). *Momentary stress* was measured with the question “How stressed are you right now?” (0 = not at all; 100 = very).

Data Analysis

Multilevel models were used to accommodate nested data (repeated occasions nested within persons; see Author Note 1). Positive and negative affect were modeled (separately) as outcomes in all models. In Model 1, health was modeled as a function of momentary affect (health sensitivity). Health sensitivity predictors and covariates were added in Model 2, with Level 1 specified as follows:

$$\text{Affect}_{ti} = \beta_{0i} + \beta_{1i} (\text{Health}_{ti}) + \beta_{2i} (\text{Stress}_{ti}) + e_{ti} \quad (1)$$

where Affect_{ti} of person i at time t is a function of a person-specific intercept (β_{0i}), person-specific coefficients indicating the extent to which affect is associated with health (β_{1i}) and with stress (β_{2i}), as well as residual error (e_{ti}). Between-person differences in intercept and health sensitivity were modeled as follows:

$$\begin{aligned} \beta_{0i} = & \gamma_{00} + \gamma_{01} (\text{Age}_i) + \gamma_{02} (\text{Women}_i) \\ & + \gamma_{03} (\text{Education}_i) + \gamma_{04} (\text{Neuroticism}_i) \\ & + \gamma_{05} (\text{Perceptual Speed}_i) + \gamma_{06} (\text{Morbidity}_i) \\ & + \gamma_{07} (\text{COVID - 19 Risk}_i) \\ & + \gamma_{08} (\text{COVID - 19 Worry}_i) \\ & + \gamma_{09} (\text{COVID - 19 Worry Other}_i) + u_{0i}, \end{aligned} \quad (2)$$

$$\begin{aligned} \beta_{1i} = & \gamma_{10} + \gamma_{11} (\text{Age}_i) + \gamma_{12} (\text{Morbidity}_i) \\ & + \gamma_{13} (\text{COVID - 19 Risk}_i) \\ & + \gamma_{14} (\text{COVID - 19 Worry}_i) \\ & + \gamma_{15} (\text{COVID - 19 Worry Other}_i), \end{aligned} \quad (3)$$

$$\beta_{2i} = \gamma_{20} \quad (4)$$

where γ_{00} , γ_{10} , and γ_{20} indicate prototypical levels of affect, health sensitivity, and stress sensitivity, respectively. Parameters γ_{01-09} indicate the extent to which between-person differences in affect are related to covariates. Parameters γ_{11-15} indicate the extent to which differences in health sensitivity are related to moderators. Person i 's deviation from the intercept is denoted by u_{0i} . We also tested COVID-19 \times age interactions, as well as whether the individual was alone versus with someone when completing questionnaires (see Potter, Röcke, et al., 2022, for a full discussion), but these were not reliably different from zero, and hence pruned for parsimony. Models were implemented in SAS with incomplete data treated as missing-at-random under full information likelihood (Little & Rubin, 2019). Time-varying Level 1 predictors were centered within-persons and Level 2 predictors were centered between-persons. Research into older adults' emotional reactions to health fluctuations during the pandemic is underexplored. We therefore chose a significance level of $p < .05$ to allow small effects to surface.

Results

Within-person descriptive statistics are reported in Table 1. As can be seen, positive and negative affect showed significant moderate-to-strong correlations with health ($r = 0.42$ and $r = -0.36$, respectively) and small-to-moderate correlations with perceived COVID-19 risks and worries (range: $r = -0.11$ to 0.23). Health showed small correlations with perceived COVID-19 stressors (range: $r = -0.05$ to -0.15).

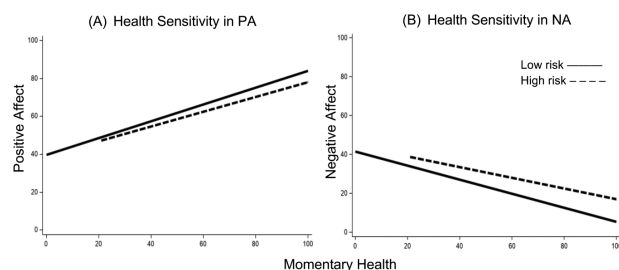


Figure 1. The moderating role of perceived risk of contracting coronavirus disease 2019 (COVID-19) for health sensitivity. *Notes:* Health sensitivity can be seen: Moments when people report poorer health, they also report lower positive affect (Panel A) and higher negative affect (Panel B). The relative reduction in positive affect is more pronounced among those who perceive more risk of having contracted COVID-19 ($1/2$ SD above average; dotted lines) relative to those who perceived less risk ($1/2$ SD below average; solid lines). Hence, health sensitivity in positive and negative affect was higher for those who perceived themselves at higher risk of having contracted COVID-19.

Table 1. Descriptive Statistics and Within-Person Intercorrelations Among Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age (67–88)		0.14	−0.07	0.03	−0.08	−0.01	0.16	−0.20	0.16	−0.20	0.12	0.10	0.18
2. Education (9–18)			−0.22	−0.02	0.19	−0.06	0.03	0.09	−0.02	0.06	0.07	0.05	0.11
3. Female (51.5%)				−0.04	0.10	0.14	0.02	−0.07	−0.02	0.01	0.07	0.05	0.05
4. Morbidity (0–8)					−0.19	0.10	−0.03	−0.00	−0.05	−0.14	0.05	0.06	0.11
5. Perceptual speed (20–67)						−0.13	−0.07	0.08	−0.12	0.05	0.03	0.05	0.12
6. Neuroticism (1–7)							0.28	−0.36	0.41	−0.21	0.11	0.10	0.18
7. Stress (0–100)								−0.60	0.82	−0.23	0.16	0.19	0.15
8. Positive affect (0–100)									−0.70	0.42	−0.15	−0.16	−0.11
9. Negative affect (0–82)										−0.36	0.19	0.23	0.21
10. Health (0–100)											−0.05	−0.07	−0.15
11. COVID risk (0–100)												0.65	0.33
12. COVID worry (0–100)													0.37
13. COVID others (0–100)													
M	76.35	14.31	0.41	1.39	44.86	3.21	20.18	72.23	16.77	76.31	5.42	5.13	13.76
SD	3.86	2.72	0.49	1.40	9.53	1.22	22.78	16.09	15.86	18.13	10.80	9.69	20.11
ICC							0.64	0.64	0.63	0.69	0.32	0.37	0.62

Notes: COVID risk = perceived risk of contracting coronavirus disease 2019 (COVID-19); COVID worry = worry about COVID-19 affecting one’s own health; COVID others = worry about COVID-19 affecting the health of a close other; ICC = intraclass correlation. Values for daily data are the averages of person-specific means across days. Intercorrelations of $r = |0.08|$ or above differ statistically significantly from zero at $p < .05$.

Intraclass correlations indicate high moment-to-moment variability in affect, health, and stress, and moderate variability in perceived COVID-19 risk and worries. Results are reported in Table 2.

Health Sensitivity in Older Adults’ Daily Lives

Evidence arose for health sensitivity: In moments participants perceived their health to be worse than usual, they also reported lower PA ($\gamma_{10} = 0.22, p < .001$) and higher NA than usual ($\gamma_{10} = -0.30, p < .001$). Increasing age was unrelated to health sensitivity in PA ($\gamma_{11} = -0.01, p = .121$) and NA ($\gamma_{11} = 0.01, p = .132$).

Moderators of Health Sensitivity

Contrary to expectations, higher morbidity was associated with lower health sensitivity in PA ($\gamma_{12} = -0.04, p = .002$) and was unrelated to health sensitivity in NA ($\gamma_{12} = 0.14, p = .210$). Most importantly, evidence arose for perceived COVID-19 risks and worries: Greater perceived risk of contracting COVID-19 was associated with higher health sensitivity in both PA ($\gamma_{13} = 0.003, p = .043$) and NA ($\gamma_{13} = -0.004, p = .005$), whereas worries about COVID-19 affecting one’s own health or that of people’s loved ones were unrelated to health sensitivity (see Figure 1).

In follow-up analyses, we additionally tested for moderation by marital status, neuroticism (Kroencke et al., 2020), and moderation of health sensitivity \times COVID-19 risks and worries by morbidity because those with poorer health are more vulnerable to COVID-19 (Hu et al., 2021). Results indicated that neuroticism was associated with heightened health sensitivity in PA but not NA—a finding inconsistent

with established neuroticism–negative affectivity associations, but consistent with previous research documenting its conflicting, and often inconsistent, association with health sensitivity (see Potter, Gerstorf, et al., 2022). As with the findings from our previous work, we found no evidence for the role of marital status (see Potter, Röcke, et al., 2022, for a full discussion on social determinants of health). Interestingly, findings suggest that morbidity dampens health sensitivity when individuals are worried about COVID-19 affecting a loved one’s health, possibly because worrying about another’s health distracts from one’s own.

Discussion

This study examined daily health sensitivity and its moderators (age, morbidity, perceived COVID-19 risks and worries) among older adults living through the second or third wave of the COVID-19 pandemic.

Health Sensitivity in Older Adults’ Daily Lives

The finding that age was unrelated to health sensitivity contrasts previous findings (i.e., lower health sensitivity: Potter, Gerstorf, et al., 2022; Potter, Röcke, et al., 2022; Schöllgen et al., 2016), indicating that broad-based contextual factors (i.e., the pandemic) alter or diminish otherwise beneficial age effects. This is consistent with well-established conceptual and empirical research indicating that older adults’ skill and experience at maintaining everyday well-being is undermined in circumstances where stress is prolonged and inescapable (Charles, 2010). It would be important to substantiate findings in higher risk populations (e.g., nursing

Table 2. Multilevel Model Testing for Health Sensitivity (Model 1) and Moderation by Age, Morbidity and COVID-19 Risks and Worries (Model 2)

	Positive affect			Negative affect		
	Est.	CI ₉₅ Lower	Upper	Est.	CI ₉₅ Lower	Upper
Model 1						
Intercept γ_{00}	72.08**	70.30	73.85	17.45**	15.57	19.32
Health γ_{10}	0.34**	0.31	0.36	-0.32**	-0.35	-0.29
Model 2						
Intercept γ_{00}	73.22**	71.01	75.42	17.69**	15.02	20.35
Age γ_{01}	-0.09	-0.54	0.36	-0.01	-0.56	0.53
Female γ_{02}	-1.99	-5.64	1.65	-1.64	-6.03	2.75
Education γ_{03}	0.19	-0.45	0.83	0.09	-0.68	0.86
Morbidity γ_{04}	0.49	-0.74	1.71	-2.04*	-3.52	-0.56
Percep. speed γ_{05}	-0.05	-0.24	0.13	-0.03	-0.25	0.19
Neuroticism γ_{06}	-3.44**	-4.93	-1.95	3.81**	2.01	5.61
Stress γ_{20}	-0.25**	-0.26	-0.23	0.23**	0.21	0.24
Health γ_{10}	0.22**	0.19	0.26	-0.30**	-0.34	-0.27
COVID risk γ_{07}	-0.06**	-0.10	-0.02	0.03	-0.02	0.07
COVID worry γ_{08}	0.04	-0.01	0.08	0.06*	0.01	0.11
COVID worry other γ_{09}	-0.004	-0.04	0.03	0.07*	0.03	0.11
Health \times age γ_{11}	-0.01	-0.02	0.001	0.01	-0.00	0.01
Health \times morbidity γ_{12}	-0.04**	-0.06	-0.02	0.14	-0.22	0.70
Health \times COV.risk γ_{13}	0.003*	0.0002	0.005	-0.004*	-0.01	-0.001
Health \times COV.worry γ_{14}	-0.001	-0.004	-0.001	0.0003	-0.003	0.003
Health \times COV.other γ_{15}	0.0001	-0.001	0.003	0.0004	-0.001	0.002
Random effects						
Variance intercept σ_u	64.16	43.56	86.04	94.45	80.11	100.01
Residual variance σ_e	71.87	70.02	74.44	87.49	84.29	90.10

Notes: Percep. speed = perceptual speed; COV.risk = perceived risk of contracting coronavirus disease 2019 (COVID-19); COV.worry = worry about COVID-19 affecting own health; COV.other = worry about COVID-19 affecting the health of a close other.

** $p < .01$. * $p < .05$.

home residents) and at different stages of the pandemic to identify when age benefits are compromised.

The Role of Morbidity

It is surprising that higher morbidity was associated with *lower* health sensitivity given that increasing age and poorer health denote vulnerability to COVID-19 (Hu et al., 2021). One possibility is that this vulnerability caused older adults to distance themselves from aging (Terraciano et al., 2021), thereby lessening the threat of morbidity. Findings are also consistent with conceptual accounts indicating that habituation continues in times of crisis and thus substantiates past reports (Potter, Röcke, et al., 2022). Future studies should examine health conditions that denote more vulnerability to COVID-19 (e.g., respiratory disease), and medications linked to symptom fluctuation. Given its potential importance in shaping health behaviors and its significance for health research (see Potter, Gerstorf, et al., 2022, for a full discussion and direct examination), it would also be important to estimate the extent to which health sensitivity

intersects with other conceptually similar and clinically relevant constructs (e.g., health anxiety, negative affectivity).

The Role of Perceived COVID-19 Risks and Worries

Importantly, perceived COVID-19 risks and worries heightened health sensitivity. This finding extends prior evidence of sociocontextual antecedents to older adults' everyday emotional experiences and is consistent with the idea that COVID-19 reflects a testing-the-limits situation whereupon older adults' regulatory/coping resources are challenged (Kliegl et al., 1990) and with the notion that COVID-19 stressors might cause older adults to appraise innocuous health fluctuations as threatening. As participants were fully vaccinated in this study, future research should examine the role of vaccination status.

It is surprising that perceived risk of contracting COVID-19, but not worry about COVID-19 affecting health, heightened health sensitivity. One possibility is that the perceived risk of contracting COVID-19 more directly tracks

objective risk and thus more readily challenges regulatory/coping capacities, whereas other COVID-19 factors might only challenge such capacities when there is a genuine (perceived) risk of having COVID-19. Researchers should examine exposure to objective risk factors (e.g., contact with the infected person).

Limitations

It is important to note that the observational design of this study did not allow for causal inferences, but rather addressed whether happy/sad moments are associated with good/bad health moments. It is thus crucial to substantiate results with models that allow for simultaneous testing of numerous causal pathways (e.g., Bivariate Change Model: McArdle & Hamagami, 2001). Furthermore, older adults' tendency to underreport symptoms, lack of sample diversity (all were white), and few in the oldest-age range makes it important to substantiate results with objective measures of health (e.g., cortisol) in more diverse samples.

Conclusion

Results indicate that sociocontextual factors related to COVID-19 modulate older adults' emotional reactions to fluctuations in health, thereby underscoring the consequences of COVID-19 for older adults' everyday well-being. Results may be relevant to clinicians/gerontologists seeking to support older adults in their everyday life during the pandemic.

Author Note

1. Day-level variation was not considered because older adults' weeks are not structured by obligations/responsibilities that may otherwise prompt variation (e.g., work/childcare). Indeed, 80% of the variance across all variables of interest were momentary rather than daily. Random effects were removed as models would not converge.

Supplementary Material

Supplementary data are available at *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* online.

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Conflict of Interest

None declared.

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