Emotion

Pandemic Boredom: Little Evidence That Lockdown-Related Boredom Affects Risky Public Health Behaviors Across 116 Countries

Erin C. Westgate, Nicholas R. Buttrick, Yijun Lin, Gaelle El Helou, Maximilian Agostini, Jocelyn J. Bélanger, Ben Gützkow, Jannis Kreienkamp, Georgios Abakoumkin, Jamilah Hanum Abdul Khaiyom, Vjollca Ahmedi, Handan Akkas, Carlos A. Almenara, Mohsin Atta, Sabahat Cigdem Bagci, Sima Basel, Edona Berisha Kida, Allan B. I. Bernardo, Phatthanakit Chobthamkit, Hoon-Seok Choi, Mioara Cristea, Sára Csaba, Kaja Damnjanovic, Ivan Danyliuk, Arobindu Dash, Daniela Di Santo, Karen M. Douglas, Violeta Enea, Daiane Gracieli Faller, Gavan Fitzsimons, Alexandra Gheorghiu, Ángel Gómez, Ali Hamaidia, Qing Han, Mai Helmy, Joevarian Hudiyana, Bertus F. Jeronimus, Ding-Yu Jiang, Veljko Jovanović, Željka Kamenov, Anna Kende, Shian-Ling Keng, Tra Thi Thanh Kieu, Yasin Koc, Kamila Kovyazina, Inna Kozytska, Joshua Krause, Arie W. Kruglanski, Anton Kurapov, Maja Kutlaca, Nóra Anna Lantos, Edward P. Lemay, Jr., Cokorda Bagus Jaya Lesmana, Winnifred R. Louis, Adrian Lueders, Marta Maj, Najma Iqbal Malik, Anton Martinez, Kira O. McCabe, Jasmina Mehulić, Mirra Noor Milla, Idris Mohammed, Erica Molinario, Manuel Moyano, Hayat Muhammad, Silvana Mula, Hamdi Muluk, Solomiia Myroniuk, Reza Najafi, Claudia F. Nisa, Boglárka Nyúl, Paul A. O'Keefe, Jose Javier Olivas Osuna, Evgeny N. Osin, Joonha Park, Gennaro Pica, Antonio Pierro, Jonas Rees, Anne Margit Reitsema, Elena Resta, Marika Rullo, Michelle K. Ryan, Adil Samekin, Pekka Santtila, Edyta Sasin, Birga M. Schumpe, Heyla A. Selim, Michael Vicente Stanton, Wolfgang Stroebe, Robbie M. Sutton, Eleftheria Tseliou, Akira Utsugi, Jolien Anne van Breen, Caspar J. Van Lissa, Kees Van Veen, Michelle R. vanDellen, Alexandra Vázquez, Robin Wollast, Victoria Wai-lan Yeung, Somayeh Zand, Iris Lav Žeželj, Bang Zheng, Andreas Zick, Claudia Zúñiga, and N. Pontus Leander

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Erin C. Westgate[1], Nicholas R. Buttrick[2], Yijun Lin[1], Gaelle El Helou[1], Maximilian Agostini[3], Jocelyn J. Bélanger[4], Ben Gützkow[3], Jannis Kreienkamp[3], Georgios Abakoumkin[5], Jamilah Hanum Abdul Khaiyom[6], Vjollca Ahmedi[7], Handan Akkas[8], Carlos A. Almenara[9], Mohsin Atta[10], Sabahat Cigdem Bagci[11], Sima Basel[12], Edona Berisha Kida[13], Allan B. I. Bernardo[14], Phatthanakit Chobthamkit[15], Hoon-Seok Choi[16], Mioara Cristea[17], Sára Csaba[18], Kaja Damnjanovic[19], Ivan Danyliuk[20], Arobindu Dash[21], Daniela Di Santo[22], Karen M. Douglas[23], Violeta Enea[24], Daiane Gracieli Faller[25], Gavan Fitzsimons[26], Alexandra Gheorghiu[27], Ángel Gómez[28], Ali Hamaidia[29], Qing Han[30], Mai Helmy[31], Joevarian Hudiyana[32], Bertus F. Jeronimus[3], Ding-Yu Jiang[33], Veljko Jovanović[34], Željka Kamenov[35], Anna Kende[36], Shian-Ling Keng[37], Tra Thi Thanh Kieu[38], Yasin Koc[3], Kamila Kovyazina[39], Inna Kozytska[20], Joshua Krause[3], Arie W. Kruglanski[40], Anton Kurapov[20], Maja Kutlaca[41], Nóra Anna Lantos[36], Edward P. Lemay Jr.[40], Cokorda Bagus Jaya Lesmana[42], Winnifred R. Louis[43], Adrian Lueders[44], Marta Maj[45], Najma Iqbal Malik[10], Anton Martinez[46], Kira O. McCabe[47], Jasmina Mehulić[35], Mirra Noor Milla[32], Idris Mohammed[48], Erica Molinario[40], Manuel Moyano[49], Hayat Muhammad[50], Silvana Mula[51], Hamdi Muluk[32], Solomiia Myroniuk[3], Reza Najafi[52], Claudia F. Nisa[4], Boglárka Nyúl[36], Paul A. O'Keefe[37, 53], Jose Javier Olivas Osuna[54], Evgeny N. Osin[55], Joonha Park[56], Gennaro Pica[57], Antonio Pierro[22], Jonas Rees[58, 59, 60], Anne Margit Reitsema[61], Elena Resta[51], Marika Rullo[62], Michelle K. Ryan[63, 64], Adil Samekin[65], Pekka Santtila[66], Edyta Sasin[4], Birga M. Schumpe[67], Heyla A. Selim[68], Michael Vicente Stanton[69], Wolfgang Stroebe[3], Robbie M. Sutton[23], Eleftheria Tseliou[5], Akira Utsugi[70], Jolien Anne van Breen[71], Caspar J. Van Lissa[72], Kees Van Veen[73], Michelle R. vanDellen[74], Alexandra Vázquez[28], Robin Wollast[44], Victoria Wai-lan Yeung[75], Somayeh Zand[52], Iris Lav Žeželj[19], Bang Zheng[76], Andreas Zick[59], Claudia Zúñiga[77], and N. Pontus Leander[3]

[1] Department of Psychology, University of Florida
[2] Department of Psychology, University of Virginia
[3] Department of Psychology, University of Groningen
[4] Department of Psychology, New York University, Abu Dhabi
[5] Laboratory of Psychology, Department of Early Childhood Education, University of Thessaly
[6] Department of Psychology, International Islamic University Malaysia
[7] Department of Pedagogy, Pristine University
[8] Department of Organizational Behavior, Ankara Science University
[9] Faculty of Health Science, Universidad Peruana de Ciencias Aplicadas
[10] Department of Psychology, University of Sargodha
[11] Department of Psychology, Sabanci University

Erin C. Westgate https://orcid.org/0000-0002-9116-6246
Yijun Lin https://orcid.org/0000-0001-8215-1440
Gaelle El Helou https://orcid.org/0000-0003-3125-7434
Maximilian Agostini https://orcid.org/0000-0001-6435-7621
Jocelyn J. Bélanger https://orcid.org/0000-0003-3881-0335
Ben Gützkow https://orcid.org/0000-0003-0994-1555
N. Pontus Leander https://orcid.org/0000-0002-3073-5038

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Correspondence concerning this article should be addressed to Erin C. Westgate, Department of Psychology, University of Florida, 945 Center Drive, Gainesville, FL 32601, United States. Email: erinwestgate@ufl.edu

[12] Department of Social Sciences, New York University, Abu Dhabi
[13] Faculty of Education, Pristine University
[14] Department of Psychology, De La Salle University
[15] Department of Psychology, Thammasat University
[16] Department of Psychology, Sungkyunkwan University
[17] Department of Psychology, Heriot Watt University
[18] Doctoral School of Psychology, ELTE, Eötvös Loránd University
[19] Department of Psychology, University of Belgrade
[20] Department of Psychology, Taras Shevchenko National University of Kyiv
[21] Institute of Management and Organization, Leuphana University of Luneburg
[22] Department of Social and Developmental Psychology, University "La Sapienza", Rome
[23] School of Psychology, University of Kent
[24] Department of Psychology, Alexandru Ioan Cuza University
[25] Center for Global Sea Level Change, New York University, Abu Dhabi
[26] Department of Marketing and Psychology, Duke University
[27] Center for European Studies, Faculty of Law, Alexandru Ioan Cuza University
[28] Social and Organizational Psychology, Universidad Nacional de Educación a Distancia
[29] Psychology/Research Unit Human Resources Development, Setif 2 University
[30] The School of Psychological Science, University of Bristol
[31] Department of Psychology, Menoufia University
[32] Department of Psychology, Universitas Indonesia
[33] Department of Psychology, National Chung-Cheng University
[34] Department of Psychology, University of Novi Sad
[35] Faculty of Humanities and Social Sciences, University of Zagreb
[36] Department of Social Psychology, ELTE, Eötvös Loránd University
[37] Division of Social Science, Yale-NUS College
[38] Department of Psychology, HCMC University of Education
[39] Nur-Sultan, Kazakhstan
[40] Department of Psychology, University of Maryland
[41] Department of Psychology, Durham University
[42] Department of Psychiatry, Udayana University
[43] School of Psychology, University of Queensland
[44] Laboratoire de Psychologie Sociale et Cognitive, Université Clermont-Auvergne
[45] Institute of Psychology, Jagiellonian University
[46] Department of Psychology, University of Sheffield
[47] Department of Psychology and Human Development, Vanderbilt University
[48] Mass Communication, Usmanu Danfodiyo University Sokoto
[49] Department of Psychology, University of Cordoba
[50] Department of Psychology, University of Peshawar
[51] Dipartimento dei Processi di Sviluppo e Socializzazione, University "La Sapienza", Rome
[52] Department of Psychology, Islamic Azad University, Rasht Branch
[53] Department of Management and Organisation, National University of Singapore Business School
[54] Department of Political Science and Administration, National Distance Education University (UNED)
[55] Department of Psychology, National Research University Higher School of Economics
[56] Graduate School of Management, NUCB Business School
[57] School of Law, University of Camerino
[58] Research Institute Social Cohesion, University of Bielefeld
[59] Institute for Interdisciplinary Research on Conflict and Violence, University of Bielefeld
[60] Department of Social Psychology, University of Bielefeld
[61] Department of Developmental Psychology, University of Groningen
[62] Department of Educational, Humanities and Intercultural Communication, University of Siena
[63] Department of Psychology, University of Exeter
[64] Faculty of Economics and Business, University of Groningen
[65] Department of Psychology of Religion and Pedagogy, International Islamic Academy of Uzbekistan
[66] Department of Psychology, New York University Shanghai
[67] Faculty of Social and Behavioural Sciences, University of Amsterdam
[68] Department of Psychology, King Saud University
[69] Health Sciences, California State University, East Bay

[70] Graduate School of Humanities, Nagoya University
[71] Institute of Security and Global Affairs, Leiden University
[72] Department of Methodology & Statistics, Utrecht University
[73] Sustainable Society, University of Groningen
[74] Department of Psychology, University of Georgia
[75] Department of Psychology, Lingnan University
[76] Ageing Epidemiology Research Unit, School of Public Health, Faculty of Medicine, Imperial College London
[77] Department of Psychology, Universidad de Chile

Some public officials have expressed concern that policies mandating collective public health behaviors (e.g., national/regional "lockdown") may result in behavioral fatigue that ultimately renders such policies ineffective. Boredom, specifically, has been singled out as one potential risk factor for noncompliance. We examined whether there was empirical evidence to support this concern during the COVID-19 pandemic in a large cross-national sample of 63,336 community respondents from 116 countries. Although boredom was higher in countries with more COVID-19 cases and in countries that instituted more stringent lockdowns, such boredom did not predict longitudinal within-person decreases in social distancing behavior (or vice versa; n = 8,031) in early spring and summer of 2020. Overall, we found little evidence that changes in boredom predict individual public health behaviors (handwashing, staying home, self-quarantining, and avoiding crowds) over time, or that such behaviors had any reliable longitudinal effects on boredom itself. In summary, contrary to concerns, we found little evidence that boredom posed a public health risk during lockdown and quarantine.

Keywords: emotion, self-regulation, public health, Simpson's paradox, COVID-19

In early spring of 2020, as the initial outbreak of COVID-19 spread across the globe, a variety of public officials expressed concern that policies mandating collective public health behaviors (e.g., national/regional "lockdown") to control the rapidly unfolding pandemic may result in behavioral fatigue, ultimately rendering such policies ineffective (e.g., Wood, 2020). While many factors play into potential fatigue, some media (e.g., Gupta, 2021; Harrison, 2021) and social scientists (e.g., Boylan et al., 2021; Brosowsky et al., 2021; Martarelli & Wolff, 2020; Wolff et al., 2020) pinpointed *boredom* specifically as one such element that might contribute to breaking social distancing guidelines intended to reduce the spread of disease. However, how prevalent was "pandemic boredom" globally during the 2020 COVID-19 outbreak, and what (if any) were its consequences? We examined whether there was empirical evidence to support the concern that boredom during COVID-19 posed a public health risk in a large cross-national sample of 63,336 community respondents from 116 countries.

Long neglected in affective science, boredom has seen a resurgence of interest in psychology as an important indicator of cognitive engagement and a motivator of behavioral change and self-regulation (e.g., Elpidorou, 2014; Lin & Westgate, in press; Milyavskaya et al., 2019; Westgate & Wilson, 2018; Wojtowicz et al., 2019). While some people may experience boredom more easily or more intensely than others (i.e., trait boredom, or "boredom proneness"), all of us experience the feeling of boredom at times (i.e., state boredom, as an emotion; see Fisher et al., 2018; Westgate & Steidle, 2020).[1] According to the Meaning and Attentional Components (MAC) model, such boredom signals a need to restore meaningful engagement due to a lack of meaning and/or attention (Westgate, 2020; Westgate & Wilson, 2018). To do so, people respond by regulating cognitive demands and resources, regulating goal value, or switching activities altogether. Perhaps to facilitate this, people become especially sensitive to reward when bored (Milyavskaya et al., 2019), gravitating toward new and novel experiences, even when those experiences are negative (Bench & Lench, 2019). For instance, bored people are more willing both to shock themselves (Havermans et al., 2015; Nederkoorn et al., 2016; Wilson et al., 2014), and to knowingly cause harm to others; experimentally inducing boredom in the lab increases the number of worms participants attempt to kill (i.e., in a coffee grinder), and makes it more likely that they will dock other fellow participants' bonus pay (Pfattheicher et al., 2021).

At the same time, boredom has been identified as one of the biggest psychological challenges of lockdown and quarantine (Barari et al., 2020; Martarelli & Wolff, 2020), in Italy and elsewhere (Brooks et al., 2020). Boredom in France increased dramatically during lockdown (Cohen's d = .71; Droit-Volet et al., 2020), and evidence from both Google searches (Brodeur et al., 2021; Lin & Westgate, in press) and polling data (Gallup, 2021; Smith, 2020) suggest corresponding increases in the United States and United Kingdom. Forty-five percent of Americans and 34% of Britons (up from 19%) reported experiencing boredom by late March 2020, in the weeks after initial lockdowns in response to widespread outbreaks of COVID-19. Furthermore, cross-sectional research has linked pandemic boredom to greater stress, anxiety, depression, and lower life satisfaction (Chao et al., 2020; Deng et al., 2020; Olaigbe et al., 2021; Waterschoot et al., 2021), while boredom *proneness* during the pandemic has been linked to depression and anxiety (Yan et al., 2021).

As such, people complying with social distancing and isolation measures may have been particularly likely to experience boredom (i.e., due to reduced opportunities for optimal challenge and meaning-making), as well as to respond to such boredom in maladaptive ways. Emotions influence behavior via feedback and expectations (see Baumeister et al., 2007, for a theoretical overview). That is, if people *believe* that socializing will reduce boredom, they should be

[1] We use the term "boredom" throughout to refer specifically to boredom as an emotion or emotional *state*; we use the term "boredom proneness" or "trait boredom" to refer to individual differences in the tendency to experience boredom more often, more easily, or more intensely than others (see e.g., Westgate & Steidle, 2020).

more likely to socialize when bored. And if socializing (or other activities) does indeed reduce boredom as anticipated, doing so may act as positive reinforcement in a feedback cycle encouraging the use of such strategies in the future. In this way, momentary emotions can lead to lasting behavioral changes that persist over time.

This is potentially concerning, given empirical evidence that boredom not only increases willingness to harm one's self and others, but has been linked to an increase in risk-taking and noisy decision-making more broadly. For instance, inducing boredom experimentally leads people to worry less about death, see high risk activities as more rewarding (and less risky), and to more aggressively pursue profit and pop balloons on the Balloon Analogue Risk task (BART; Bench et al., 2021). Likewise, experimentally inducing boredom makes people more likely to choose risky (vs. safe) monetary gambles (Miao et al., 2020). Consistent with this, correlational studies find that people who report feeling more bored also tend to engage in riskier behavior. Yakobi and Danckert (2021) have suggested that rather than increase risk-taking per se, that boredom may actually be more closely linked to noisy decision-making; for instance, among 86 undergraduates, students who felt more bored during a BART task (in which the balloon pops at a predetermined number of pumps) also made decisions more quickly. Similarly, people who report feeling bored choose riskier financial gambles, especially in exciting (vs. dull) gambling environments (Kılıç et al., 2020), and report *feeling* more impulsive (although this effect does not generalize to experimentally-induced boredom; Moynihan et al., 2017).

However, little research has assessed boredom's effects on risk behavior outside of controlled lab settings, or on preventive behaviors that might better characterize pandemic health precautions. Does pandemic-related boredom also increase risk behaviors and/or reduce preventive health behaviors, and if so, might it have contributed to failure to comply with public health guidelines during the COVID-19 pandemic? Laboratory evidence showing that experimental induction of boredom increases novelty-seeking and reward-sensitivity (that may manifest as risk-taking and noisy decision-making) suggests it may. On the other hand, behavior in the real world has many causes. Just as the power of strong situations can swamp the effects of individual differences among people (e.g., all of us are likely to run out of a room on fire, regardless of our personality traits; see Cooper & Withey, 2009), the dangers posed by the pandemic might be sufficiently strong as to swamp any effect of temporary emotional states. It is thus unclear whether effects of boredom found in the lab will generalize to compliance with public health guidelines in the context of an unfolding global pandemic.

While our question specifically concerns experiences of *state* boredom (i.e., as an emotion; within-person), related work on individual differences in *boredom proneness* (or "trait" boredom) suggest such a connection between boredom and public health behaviors could be possible. Wolff and colleagues (2020), for instance, found that U.S. Amazon Mechanical Turk (M*Turk*) workers higher in trait boredom proneness were more likely to report difficulty adhering to social distancing during the pandemic. Likewise, Boylan and colleagues (2021) found that boredom-prone M*Turkers* reported less handwashing and more COVID-19 rule-breaking (e.g., leaving the house). And, using the same dataset, Brosowsky et al. (2021) showed that this was especially true for social (but not fiscal) conservatives. However, because these findings relied on cross-sectional correlations, they cannot determine the extent to which: (a) boredom led to failures of social distancing, (b) failure to socially distance increased boredom, or (c) known third variables (e.g., dispositional sensation-seeking; Zuckerman, 1971, 1979) accounted for both. Furthermore, because *boredom proneness* is thought to represent individual differences in people's tendency to experience boredom more easily or more intensely, it is difficult to determine whether associations with *trait* boredom (as an individual difference; between-people) generalize to *state* boredom (as an emotion; within-people; see Fisher et al., 2018). Similar challenges exist for cross-sectional studies linking pandemic boredom to decreased well-being (e.g., Chao et al., 2020; Deng et al., 2020; Olaigbe et al., 2021; Waterschoot et al., 2021).

As a result, little is known about how *state* boredom affects risk behavior in ecologically valid settings, especially over time or outside of American or Western European contexts. We investigated these questions in a large cross-national dataset of over 60,000 participants drawn from 116 countries who reported on their boredom and public health behaviors throughout the spring and early summer of 2020. Overall, while we found boredom to be slightly higher in countries that instituted stricter lockdowns during the pandemic, these effects were sensitive to the inclusion of covariates, and we found no evidence that such boredom had any reliable longitudinal effects on people's public health behaviors (or vice versa). Thus, although boredom may increase risk behavior in the lab, this effect may not always extend to behavior in real-world high-stakes settings. These findings emphasize both the need for ecologically valid research on the causal relationships of emotion on behavior, as well as the potential lack of group-to-individual generalizability posed by cross-sectional designs (Fisher et al., 2018).

Method

The study was approved by Ethics Committees of the University of Groningen (PSY-1920-S-0390) and New York University Abu Dhabi (HRPP-2020-42). Hypotheses were approved in advance by the research group, but not formally preregistered. A full list of measures, data, and analysis scripts can be found at https://osf.io/h59dt/.

Participants

Participants consisted of 63,336 community volunteers from 116 countries, including large ($n > 1{,}000$) samples from the Philippines, Indonesia, Japan, China, South Korea, Australia, South Africa, Egypt, Saudi Arabia, Turkey, Russia, Ukraine, Serbia, Romania, Greece, Italy, France, Spain, Germany, the Netherlands, United Kingdom, Canada, Argentina, Brazil, and the United States. For full demographics see Supplemental Table S1 on OSF (https://osf.io/h59dt/). In addition, longitudinal data was available for a subset of 8,031 participants.[2]

Procedure

Participants were recruited as part of the larger Psycorona study; we analyzed data from March 19 through July 6, 2020.

[2] Participants were initially volunteers and paid panel respondents recruited for a crosssectional study. As part of participation in the initial survey, participants were given the option to repost the survey on social media (snowball sampling) and sign up for the weekly longitudinal follow-ups; doing so was voluntary and uncompensated, and was not a required component of participation in the initial study.

All participants completed an initial online baseline survey; those who volunteered for the (optional) longitudinal follow-ups were recontacted weekly for 11 follow-ups at 1-week intervals.

Measures

A full codebook is available on the Open Science Framework (OSF, https://osf.io/qhyue/). Brief measures were chosen to recruit a very large sample, ensure longitudinal engagement, and facilitate translation efforts that allowed cross-national distribution. The survey was available in 30 languages including English, Spanish, Russian, Greek, Arabic, Bahasa Indonesia, and more; all languages were translated (and back-translated, or checked by other translators) by native speakers on the research team.

Boredom

At baseline, participants were asked "How did you feel over the past week?" and rated how "Bored" they felt, among other affective states (e.g., calm, exhausted), on a 5-point scale (1 = *very slightly or not at all*, 2 = *a little*, 3 = *moderately*, 4 = *quite a bit*, 5 = *extremely*; Russell, 1980). Participants reported boredom again in Wave 5, and again each week until Wave 11, for a total of up to eight measurements (baseline + seven weekly follow-ups). Direct self-reports are generally the best measure of discrete emotions (e.g., Barrett, 2004; Diener, 2000; Nisbett & Wilson, 1977; Robinson & Clore, 2002), and similar items have been used and validated in previous research (e.g., Westgate & Wilson, 2018).

Public Health Behaviors

At the time of the survey, three infection prevention behaviors were advised across most countries: washing hands, avoiding crowds, and self-isolation/self-quarantine.[3,4] Participants reported the extent to which they engaged in handwashing ("To minimize my chances of getting coronavirus, I . . . - . . . wash my hands more often"), avoided crowds (". . . avoid crowded space."), and quarantined (". . . put myself in quarantine") at baseline, as well as Waves 8 and 11, on a 7-point scale from −3 = *strongly disagree* to 3 = *strongly agree*. Participants additionally reported the number of days they left the house in the past week at baseline, as well as at Waves 5, 6, 7, 9, and 10. Because boredom was hypothesized to affect some of these behaviors (i.e., avoiding crowds, self-quarantine, or leaving the house) but not others (i.e., handwashing), each was analyzed separately.

Demographic Predictors

At baseline, participants reported gender, age, highest education, political orientation (Libertarian vs Authoritarian, Right vs Left), and country of residence. Age and education were assessed using national census measures. Participants also reported on their employment status. Please see full codebook for details (https://osf.io/qhyue/).

Country-Level Predictors

Because we were interested in whether national lockdown status predicted boredom, we also examined country-level COVID-19 cases per capita as well as country-level quarantine/lockdown status as of March 19, 2020 (Oxford Tracker for Regulation Policies). To control for possible country-level confounds, we also included the following: GDP per capita, country population, urban population, and population density (World Bank, 2014), health infrastructure (hospitals per 1 million people; doctors per 10,000 people; World Health Organization, 2020), and life expectancy (World Factbook).

Results

We first report baseline descriptives of boredom (overall and by country), and how boredom changed over time. Next, we examine the demographic, situational, and country-level predictors of boredom (at baseline; n = 63,336) using multilevel models to account for nesting of participants within individual countries; intercepts were modeled as randomly varying across countries and date was included as a covariate.[5] Finally, we report longitudinal analyses (n = 8,031) of the downstream reciprocal effect of boredom on a set of pandemic-related public health behaviors, using random-intercept cross-lagged panel models, clustering respondents by country (RI-CLPM; Hamaker et al., 2015).

Prevalence of Boredom During the COVID-19 Pandemic

How widespread was boredom during the COVID-19 pandemic of spring 2020? We first examined boredom across all 116 countries. On average, people reported that they were "a little" to "moderately" bored (M = 2.72, SD = 1.32, n = 62,498). Globally, people became significantly more bored from March through July, b = .004 (.0005), t = 9.38, $p < .001$, a change of approximately half a scalepoint. However, self-reported boredom varied (see Figure 1 and Table 1). For instance, among countries with at least 50 respondents, the highest boredom-as reported in Egypt (M = 3.62, SD = 1.13, n = 1,113), Indonesia (M = 3.33, SD = 1.36, n = 2,370), and Turkey (M = 3.27, SD = 1.24, n = 1,809)-was over a full standard deviation/scalepoint higher than the lowest boredom, as reported in Austria (M = 1.88, SD = 1.04, n = 50), Taiwan (M = 2.12, SD = 1.07, n = 163), and Switzerland (M = 2.15, SD = 1.13, n = 59).

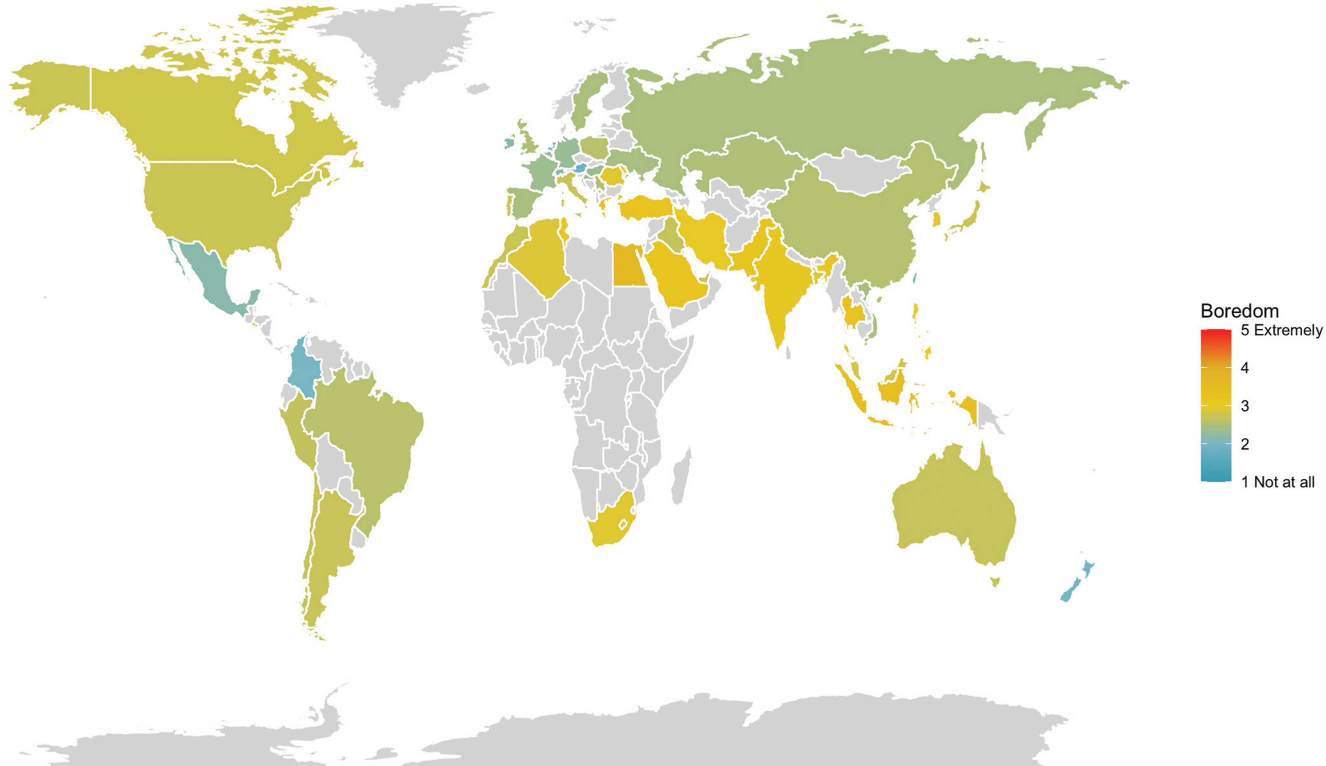
Why were some people, especially in some regions, more bored than others? We predicted boredom would be higher (at the country-

[3] Some of the dependent variables reported in this article have been analyzed and published in previous work addressing unrelated constructs (e.g., country-level cooperation; government trust); none have examined boredom or its relationship with these variables. Please see data reuse disclosure statement in repository link.

[4] Wearing a face covering was not universally recommended by the WHO until June 2020 (World Health Organization, 2020); the data for the present study was collected between March through July 2020. Before June, countries differed in regards to national health advice on mask-wearing.

[5] We first attempted to include both random slopes and intercepts in our models; because models with random slopes consistently failed to converge, we eliminated random slopes. Because boredom varied over time, and some participants completed the baseline survey at an earlier date (e.g., late March) while others did so at a later date (e.g., early July), we additionally controlled for date in the multi-level analyses predicting boredom; we did not do so for the longitudinal models examining reciprocal change between boredom and public health behaviors, as time is already accounted for by wave of data collection (e.g., Wave 5 was distributed the week of April 25, 2020).

Figure 1
Global Boredom During the Initial Outbreak of COVID-19 (March Through July 2020)



Note. For sample sizes, please see Table 1; figure depicts only countries with a minimum of at least 20 respondents. See the online article for the color version of this figure.

level) in areas more affected by the pandemic (i.e., with higher COVID-19 rates) and with more stringent lockdown policies, and (at the individual-level) among people who reported more self-quarantining and socially-isolating. As will be seen, these predictions were only partially confirmed (see Table 2 for full saturated model, and repository link for individual models; for the most part, there were few differences between individual and fully saturated models—exceptions are indicated in-text and in footnotes below).

Demographic Predictors

First, we examined demographic predictors (i.e., gender, age, education, and political orientation; centered by country mean; n = 47,512; 112 countries). Consistent with previous work, older adults, $b = -.21$ (.004), $t = -56.12$, more educated adults, $b = -.07$ (.004), $t = 17.17$, and women, $b = -.13$ (.01), $t = 11.23$, all reported less boredom, all $ps < .001$; there were no differences by political orientation, $b = -.006$ (.003), $t = 1.85$, $p = .06$. We controlled for these variables in subsequent country-level and situational analyses.

Country-Level Predictors

Next, we added country-level predictors (n = 29,097; 65 countries). We predicted boredom would be higher in countries with higher COVID-19 infection rates and with more stringent lockdown policies. Therefore, we entered COVID-19 rates and nationwide lockdown/quarantine orders (as they existed on March 19, 2020), as well as log-transformed GDP per capita, population, population density, urban population percentage, and health infrastructure (i.e., number of doctors and hospitals) as simultaneous predictors.[6] We also included two interaction terms to examine whether effects of lockdown and COVID-19 rates varied over time (see bottom of Table 2). Wealthier countries reported less boredom, $b = -.26$ (.11), $t = -2.38$, $p = .02$, as did countries with more doctors, $b = -.01$ (.005), $t = -2.06$, $p = .046$. There were no differences in boredom as a function of population, population density, urban population, life expectancy, or number of hospitals, in the full saturated model (see repository link for individual predictors), all $ts < 1.73$, all $ps > .08$.

Overall, people reported more boredom in countries with more cases of COVID-19 (as of March 19, 2020), $b = .32$ (.09), $t = 3.46$, $p < .001$. This relationship strengthened over time, interaction $b = .001$ (.003), $t = 3.66$. In addition, people reported more boredom in countries that instituted more stringent lockdown and quarantine

[6] Before analysis, we took the natural log of GDP per capita, population, population density, and confirmed cases of COVID-19. All country-level predictors were centered on their respective global mean. These variables were included to control for potential confounds in COVID-19 infection rates and lockdown policies. Political orientation and population size were both positively related to boredom when entered in the model individually (without covariates); urban population, life expectancy, and number of hospitals were all negatively related to boredom when entered in the model individually (without covariates).

Table 1
Country-Level Demographics and Self-Reported Boredom

Country of residence	Sample *n*	Boredom mean	*SD*
Albania	6	3	1.26
Algeria	191	2.88	1.2
Andorra	2	2.5	0.71
Argentina	1,382	2.7	1.32
Armenia	1	3	
Australia	1,213	2.69	1.33
Austria	50	1.88	1.04
Azerbaijan	2	2.5	0.71
Bahrain	4	2.25	1.5
Bangladesh	151	2.9	1.32
Belarus	4	2.5	1
Belgium	65	2.29	1.26
Benin	1	1	
Bosnia and Herzegovina	14	2.64	1.34
Botswana	1	1	
Brazil	1,380	2.57	1.23
Brunei	4	2.75	1.71
Bulgaria	10	2.4	1.43
Cambodia	1	1	
Cameroon	1	4	
Canada	1,534	2.77	1.31
Chile	340	2.68	1.26
China	1,558	2.54	1.17
Colombia	43	2	1.02
Costa Rica	6	2.67	1.51
Croatia	349	2.32	1.25
Cyprus	69	2.77	1.25
Czech Republic	18	2.33	1.37
Denmark	16	2.5	1.41
Dominican Republic	5	1.8	1.3
Ecuador	4	3	1.15
Egypt	1,113	3.62	1.13
El Salvador	40	3.48	1.11
Estonia	4	1	0
Ethiopia	1	4	
Finland	15	2.4	1.45
France	1,778	2.34	1.21
Georgia	6	2.67	1.21
Germany	1,683	2.3	1.22
Greece	2,810	2.94	1.26
Guatemala	3	2.33	0.58
Hong Kong S.A.R.	301	2.97	1.19
Hungary	443	2.33	1.32
Iceland	3	3.33	1.15
India	90	3.11	1.44
Indonesia	2,370	3.33	1.36
Iran	306	2.98	1.17
Iraq	31	2.68	1.35
Ireland	27	2.19	0.92
Israel	75	2.72	1.31
Italy	1,978	2.71	1.3
Jamaica	10	3.1	1.66
Japan	1,321	2.72	1.22
Jordan	9	3	1.5
Kazakhstan	788	2.49	1.25
Kenya	2	1.5	0.71
Kosovo	803	2.59	1.14
Kuwait	4	3.5	1.73
Kyrgyzstan	2	2.5	2.12
Laos	1	1	
Latvia	1	2	
Lebanon	9	2.56	1.51
Libya	3	3	1
Lithuania	15	2.27	1.49
Luxembourg	20	2.35	1.14
Malaysia	888	2.8	1.33
Mali	12	3.42	1.16
Malta	4	1.25	0.5
Mauritius	1	2	
Mexico	46	2.15	1.05
Moldova	29	3	1.31
Mongolia	1	3	
Montenegro	8	2.38	1.6
Morocco	40	2.73	1.32
Myanmar	1	2	
Nepal	2	2.5	2.12
Netherlands	3,034	2.16	1.21
New Zealand	23	2	1.28
Nigeria	5	3.6	1.67
Norway	13	2.38	1.45
Oman	1	1	
Pakistan	206	3.23	1.36
Palestine	29	3.72	1.03
Panama	2	2	0
Peru	307	2.65	1.21
Philippines	1,516	3.04	1.35
Poland	710	2.57	1.28
Portugal	46	2.7	1.07
Qatar	2	3.5	0.71
Republic of Serbia	2,087	2.53	1.26
Romania	2,667	2.92	1.39
Russia	1,388	2.46	1.26
Saudi Arabia	1,450	3.16	1.29
Singapore	249	2.73	1.24
Slovakia	10	1.9	0.88
Slovenia	2	1.5	0.71
South Africa	1,396	2.92	1.44
South Korea	1,447	2.93	1.19
Spain	3,175	2.43	1.29
Sweden	72	2.46	1.2
Switzerland	59	2.15	1.13
Taiwan	163	2.12	1.07
Thailand	155	3.26	1.04
Trinidad and Tobago	23	2.48	1.24
Tunisia	67	3.1	1.33
Turkey	1,809	3.27	1.24
Ukraine	1,366	2.43	1.23
United Arab Emirates	90	2.7	1.39
United Kingdom	1,922	2.48	1.34
United Republic of Tanzania	1	1	
United States of America	11,016	2.73	1.31
Uruguay	5	2.2	1.3
Uzbekistan	1	1	
Venezuela	14	2.36	1.22
Vietnam	244	2.45	1.18

measures as of March 19, 2020; $b = .02$ (.008), $t = 2.39$, $p = .02$, see Figure 2. This relationship became slightly stronger over time, interaction $b = .00008$ (.00003), $t = 2.36$. However, we caution that these effects were small, and not robust to analytic choices. The number of COVID-19 cases was not significantly associated with boredom at baseline when entered without covariates ($b = -.03$, $p < .001$), but positively associated with boredom when including time as a moderator (date $b = .005$, covid cases $b = .02$, interaction $b = .0009$; all $p < .001$). Lockdown policy stringency was significant only in the full saturated model; it was not significantly associated with boredom when entered in the model without covariates, with or without accounting for moderation by date. Please see repository link for details of individual models.

Table 2
Demographic, Country-Level, and Situational Predictors of Boredom as Measured at Baseline in a Multilevel Model Containing Random Intercepts by Country

Predictor	*b* (*SE*)	*t*	*p*
Age	−.20 (.01)	−43.62	<.001***
Gender	.17 (.02)	11.30	<.001***
Education	−.06 (.01)	−9.79	<.001***
Political orientation	−.003 (.004)	−0.65	.51
Employed	−.10 (.02)	−8.86	<.001***
Self-quarantine	.04 (.01)	6.25	<.001***
Avoiding crowds	−.06 (.01)	−6.37	<.001***
Leaving home	−.05 (.01)	−6.89	<.001***
GDP per capita	−.25 (.11)	−2.31	.02*
Population size	.004 (.05)	.07	.94
Population density	−.04 (.03)	−1.19	.24
Urban population	.01 (.004)	1.72	.09
Life expectancy	.02 (.02)	.99	.33
Hospitals	−.004 (.003)	−1.50	.14
Doctors	−.01 (.01)	−2.04	.05*
COVID-19 cases	.32 (.01)	3.39	<.001***
COVID-19 × Date	.001 (.0004)	3.55	<.001***
Lockdown policy	.02 (.01)	2.48	.01*
Lockdown × Date	.0001 (.00,004)	2.49	.01*
Date	.001 (.0004)	3.55	<.001***

* $p < .05$. *** $p < .001$.

Situational Predictors

Finally, we predicted quarantine and social isolation would increase boredom. We predicted boredom at baseline from the extent to which people reported self-quarantining and avoiding crowds, as well as how many days they left the house, and their current employment. All continuous variables were country-mean-centered. Finally, we controlled for date, demographics, and the country-level predictors above.

People who were unemployed reported significantly more boredom, $b = .15$ (.02), $t = 9.20$, than those employed part- or full-time. In addition, self-quarantine was indeed associated with greater boredom at baseline, $b = .04$ (.007), $t = 6.25$, $p < .001$; the more often people left the house, the less bored they were, $b = -.06$ (.01), $t = -6.89$, $p < .001$. However, avoiding crowds was associated with *lower* boredom at baseline, $b = -.06$ (.01), $t = -6.37$, $p < .001$. Thus, these results conflict; longitudinal analyses (see section below) suggest these associations may be due to between-person differences rather than within-person effects.

Longitudinal Effects of Boredom on Pandemic-Related Public Health Behavior

A subset of participants ($n = 8{,}031$) volunteered for and completed follow-up measures of boredom, beginning at Wave 5 (i.e., the week of April 25, 2020) and continuing weekly for the next seven weeks. These later waves also contained additional dependent measures, which allowed us to examine reciprocal change over time in boredom and public health behaviors using a set of random-intercept cross-lagged panel models, clustering respondents by country (RI-CLPM; Hamaker et al., 2015).

In these models, observed variables are broken down into a within-person component and a between-person component. The random-intercept captures a person's general tendency to experience a state (e.g., their typical level of boredom). In contrast, the within-person components are captured by the autoregressive relationships (e.g., from boredom at Time 1 to boredom at Time 2) and cross-lagged relationships (e.g., from boredom at Time 1 to quarantine status at Time 2). Thus, we were able to examine if feeling more bored than usual predicts fewer future public health behaviors (above and beyond past behavior), as well as its opposite; that is, whether engaging in more public health behaviors predicts feeling more bored in the future (above and beyond prior boredom; Orth et al., 2021). All models were run in M*plus* 8; scripts and output can be found at osf.io/wem8x. Model fit statistics are presented in Table 3.

Compliance With Public Health Guidelines

We began by looking at whether boredom predicted later downstream compliance with public health guidelines intended to limit the spread of COVID-19. Specifically, previous research would suggest that boredom should be associated with reduced compliance over time with public health guidelines that restrict personal and social activities (e.g., quarantine, avoiding crowds, and leaving the house), but not with public health guidelines that do not impose such restrictions (e.g., handwashing). Therefore, we examined these four outcomes separately (see Figure 3 for "Quarantine", "Avoiding Crowds", and "Handwashing"; Figure 4 for "Staying home").

Quarantine

Past boredom and quarantining robustly predicted future boredom and quarantining, respectively. On the whole, between participants, people who were more likely to report being bored were significantly less likely to report quarantining ($r = -.033$). However, the effect was very small, and, within-person, relative boredom and relative quarantine behavior were unrelated at all timepoints (*b*s = −.02, −.002, −.02). Additionally, there was little evidence that feeling *more* bored—relative to an individual's average within-person boredom—predicted higher or lower relative quarantine status over time (*b*s = −.03, .01), or vice versa (*b*s = −.003, .03). This suggests that feeling more bored than usual did not lead people to stop quarantining, and that quarantining (conversely) did not increase boredom.

Avoiding Crowds

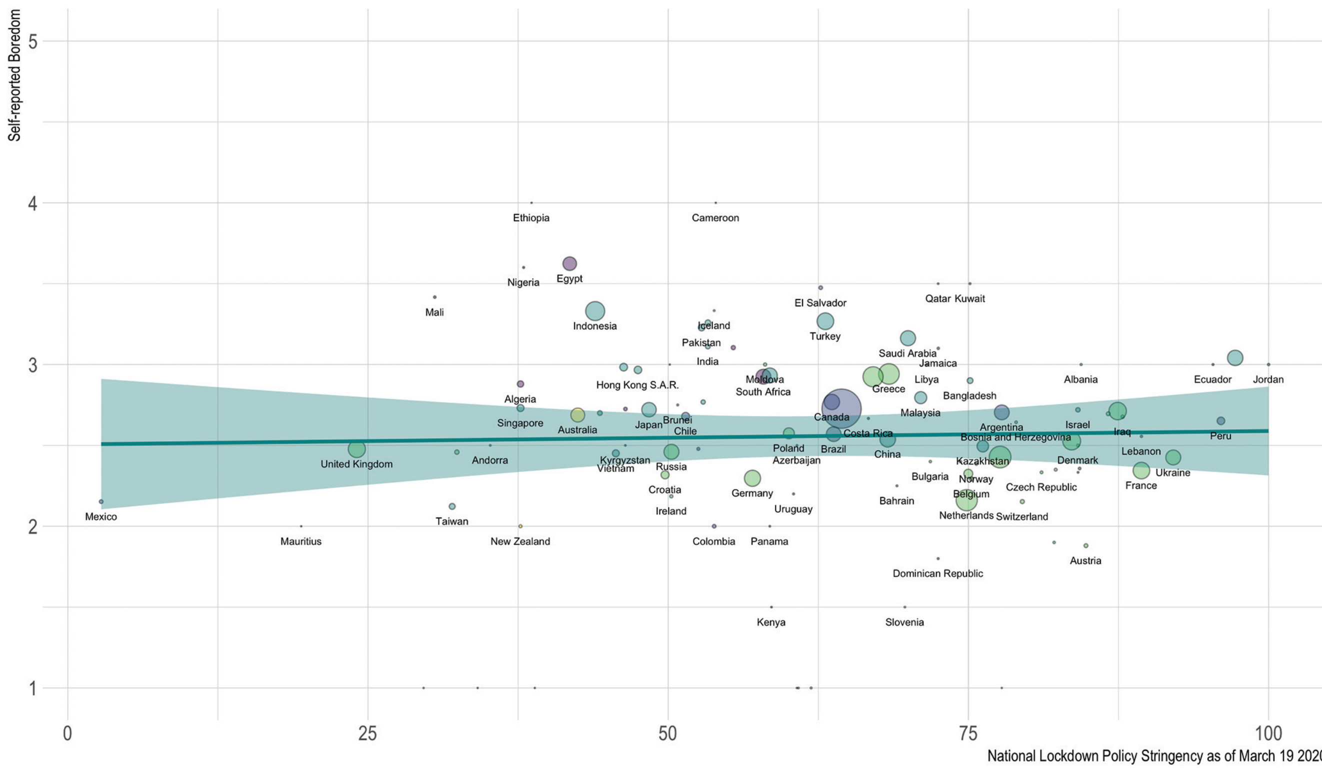
On the whole, between participants, average boredom and avoiding crowds were unrelated ($r = -.035$). Within-person, past boredom predicted future boredom; past crowd avoidance predicted future crowd avoidance at only one of the three waves (Wave 8 to 11, $b = .55$). However, relative within-person boredom and crowd avoidance were unrelated at any given timepoint (*b*s = −.02, −.01, .004). Additionally, while relative boredom at baseline negatively predicted crowd avoidance at Wave 8 ($b = -.10$), it did not predict crowd avoidance at Wave 11 ($b = -.03$). Likewise, there was little evidence that relative levels of crowd avoidance predicted boredom over time (*b*s = −.02, −.03). In all, there was little consistent evidence for a relationship between boredom and crowd avoidance.

Handwashing

On the whole, between people, participants who reported higher boredom on average were significantly more likely to report handwashing behavior ($r = .060$). Within-person, past boredom and

Figure 2

National Lockdown Policies as of March 19, 2020 Were Predictive of Small but Significant Increases in Self-Reported Boredom During COVID-19



Note. See the online article for the color version of this figure.

handwashing predicted future boredom and handwashing, respectively. However, within-person, relative boredom and relative handwashing were unrelated at any given timepoint (bs = .004, .03, .03). Additionally, there was little within-person evidence that relative boredom predicted handwashing over time (bs = −.078, .011), or vice versa (bs = .004, .011).

Staying Home

On the whole, between participants, people who reported higher average boredom also reported significantly less likelihood of leaving the house ($r = -.037$). Within-person, past boredom and leaving the house predicted future boredom and leaving the house, respectively. Relatively higher boredom within-person was contemporaneously related to relatively lower levels of leaving the house across five of the six timepoints, but at only one of the six timepoints did relative boredom (at Wave 9) predict future house-leaving (at Wave 10). At none of the timepoints did past house-leaving predict future boredom.

In summary, we saw very little evidence suggesting that feeling more bored than usual (at a given timepoint) was associated with, or predicted, *future* downstream public health behaviors related to social distancing. What effects were observed tended to be small and inconsistent, appearing across some timepoints but not at others, and only infrequently predicted future behavior change. Nor did we find that such effects were stronger for public health behaviors that restricted social activity (e.g., self-quarantine) than for public health behaviors that did not (i.e., handwashing).

Table 3

Fit Statistics for Random-Intercept Cross-Lagged Panel Models

Model	RMSEA	CFI	TLI
Quarantine	.003 [.000, .012]	1.000	.998
Avoiding crowds	.003 [.000, .012]	1.000	.997
Handwashing	.006 [.000, .014]	.999	.985
Staying home	.012 [.011, .013]	.982	.968
Happiness	.049 [.043, .055]	.986	.970
Life satisfaction	.010 [.008, .013]	.995	.984
Meaning in life	.011 [.009, .014]	.995	.985

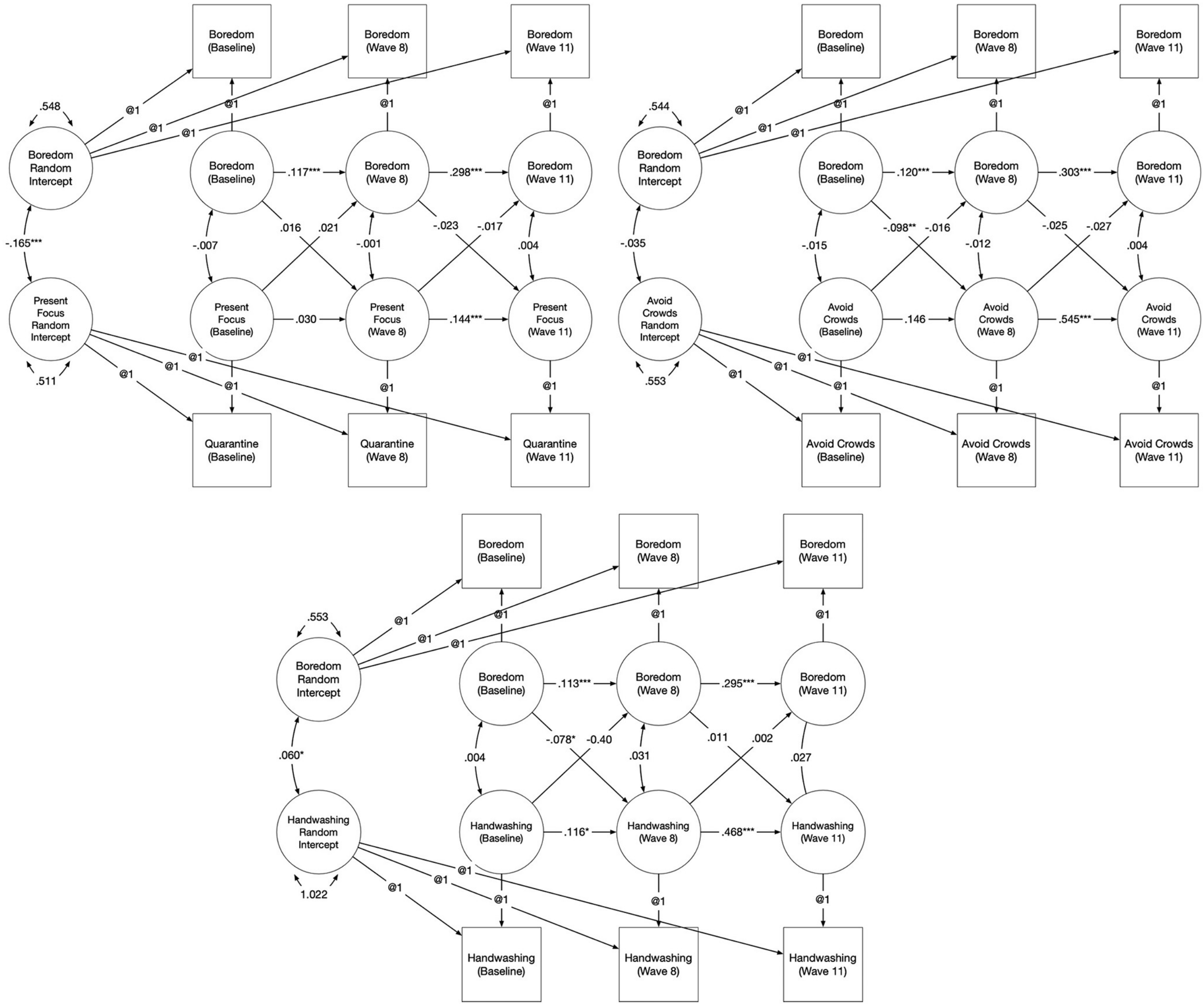
Note. RMSEA = root mean square error of approximation; CFI = comparative fit index; TLI = Tucker-Lewis index. The 90% confidence interval presented in brackets.

Exploratory Analyses: Longitudinal Effects on Psychological Well-Being

Although we did not observe effects consistent with the hypothesis that boredom leads to risky public behaviors, other recent work has also found cross-sectional relationships between pandemic boredom and impaired well-being (e.g., Chao et al., 2020). In exploratory analyses, we were able to additionally examine whether such results replicate longitudinally.

Figure 3

Random-Intercept Cross-Lagged Panel Models (RI-CLPM) Depicting Boredom as a Longitudinal Predictor of Public Health Behaviors (i.e., Self-Quarantine, Avoiding Crowds, and Handwashing)



Note. Constructs of interest are decomposed into a stable between-person random intercept and a latent within-person deviation from that intercept at a particular timepoint. All latent variables are modeled with nonzero variance (not necessarily shown here), and all manifest variables are modeled with nonzero means (not shown here). Consistent evidence for a relationship between boredom and crowd avoidance.
* $p < .05$. ** $p < .01$. *** $p < .001$.

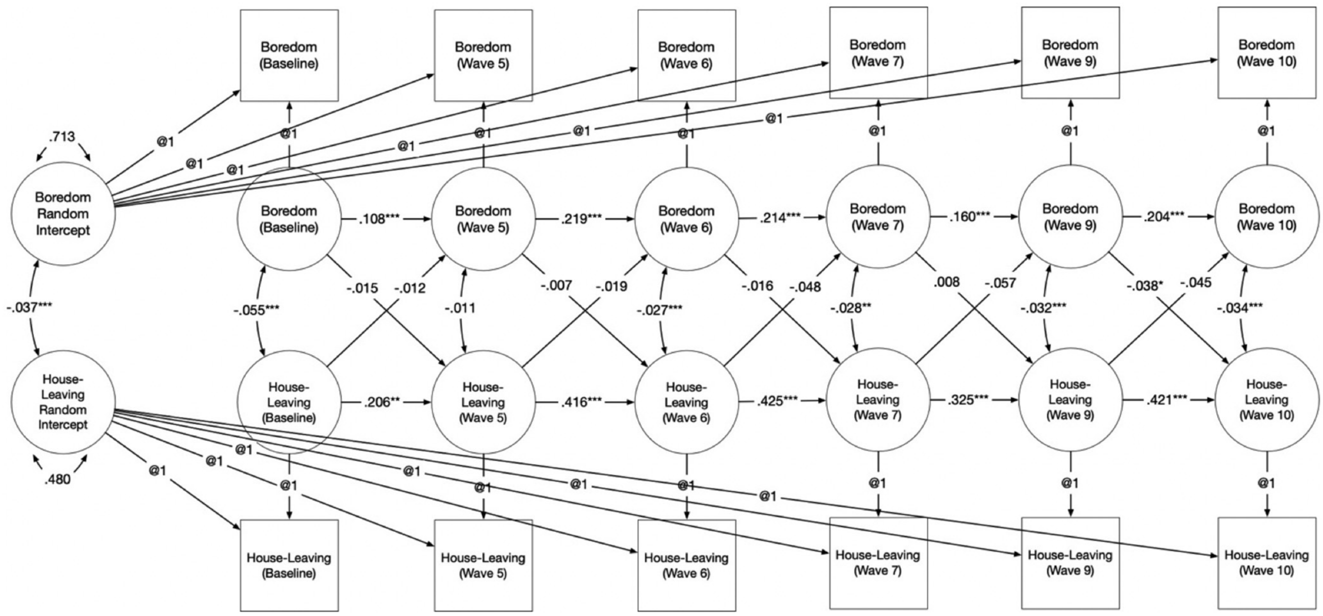
Hedonic Well-Being

We first examined whether boredom predicted changes in hedonic well-being, assessed via life satisfaction and happiness in life (see Figure 5). On the whole, between participants, there was no relationship between boredom and happiness (r = .004; ("In general, how happy would you say you are?," from 1 = *extremely happy* to 10 = *extremely unhappy*); Abdel-Khalek, 2006). Within-participants, past boredom and happiness predicted future boredom and happiness. Feeling more bored than usual (within-person) was contemporaneously related to feeling less happy than usual at two of five waves (Baseline, $r = -.033$; and Wave 11, $r = -.028$), but feeling more bored than usual did not predict future happiness. Feeling happier than usual, by contrast, did modestly predict decreased boredom from Wave 8 to Wave 9 ($b = -.075$) and from Wave 9 to Wave 11 ($b = -.085$).

On the whole, between participants, people who reported higher average boredom were also significantly less satisfied with their lives ($r = -.310$; ("In general, how satisfied are you with your life?," on a 6-point scale from 1= *very dissatisfied* to 6 = *very satisfied*); Butler & Kern, 2016). Within-person, past boredom predicted future boredom, and, across three of the four waves, past life-satisfaction predicted future life-satisfaction. Feeling more bored than usual was contemporaneously related to greater life

Figure 4

Random-Intercept Cross-Lagged Panel Models (RI-CLPM) Depicting Within-Person Boredom as a Longitudinal Predictor of the Number of Times Participants Left the House Each Week



* $p < .05$. ** $p < .01$. *** $p < .001$.

satisfaction across all four waves, but feeling more bored than usual did not predict *future* life satisfaction. Higher life satisfaction only significantly predicted decreases in future boredom from Wave 7 to Wave 11 ($b = -.111$).

Eudaimonic Well-Being

Next, we examined whether boredom predicted changes in eudaimonic well-being (Figure 5), or meaning in life ("My life has a clear sense of purpose"; on a 7-point scale from 1 = *strongly disagree* to 7 = *strongly agree*; Butler & Kern, 2016). On the whole, between participants, people who reported higher average boredom also reported significantly less purpose ($r = -.316$). Within-participants, feeling more bored than usual was contemporaneously related to feeling less purpose across all four waves. Furthermore, feeling more bored than usual predicted small but significant decreases in purpose across two of the three waves (bs = $-.038$, .035, $-.086$). Feeling more purpose than usual significantly predicted future decreases in boredom at only one of the three waves, from Wave 5 to Wave 9 ($b = -.07$).

In short, there was no evidence that feeling more bored than usual was prospectively linked to changes in *hedonic* well-being; there was, however, some limited evidence that boredom might be prospectively linked to future declines in *eudaimonic* well-being, although these effects were small and somewhat inconsistent.

Discussion

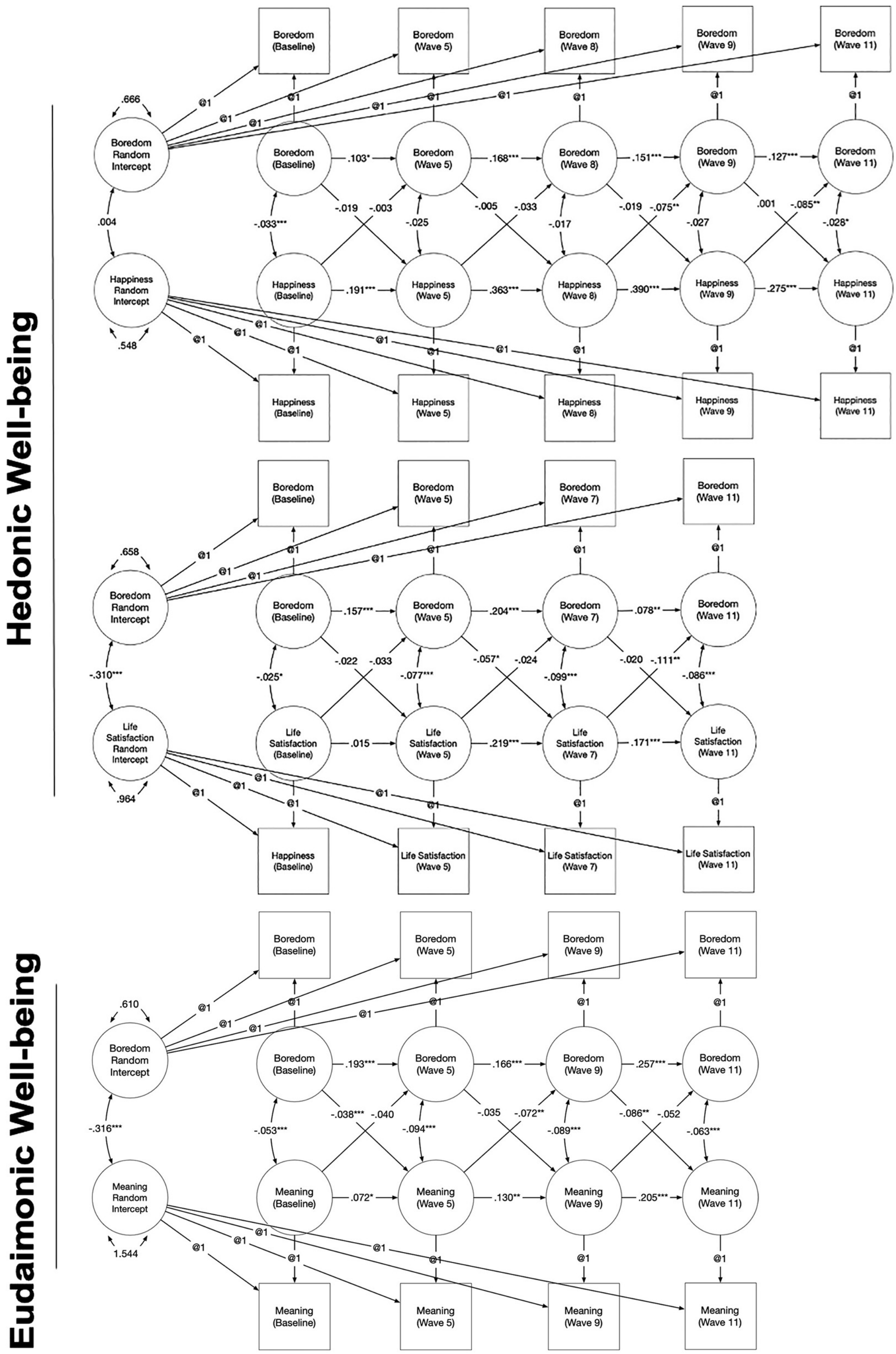
Overall, while boredom was slightly higher among countries with more cases of COVID-19 and with more stringent lockdown policies, these effects were weak and did not seem to have adverse effects on compliance. People did not feel more bored in the weeks after they reported more compliance with public health behaviors, and—importantly—did not report reduced compliance in weeks after experiencing increases in boredom. As such, contrary to fears, boredom did not appear to constitute a serious threat to public health in the context of the COVID-19 pandemic.

The MAC model predicts that boredom is caused by deficits of meaning and attention, and signals the lack of successful attentional engagement in valued goal-congruent (i.e., meaningful) activity. We found considerable cross-national variability in boredom, with the most bored countries (e.g., Egypt, Indonesia, and Turkey) reporting boredom a full standard deviation higher than the least bored countries (e.g., Switzerland, Taiwan, and the Netherlands). People reported more boredom in less wealthy countries (i.e., lower GDP) and in countries with higher rates of COVID-19 or more stringent lockdown measures, especially over time. Consistent with previous research (e.g., Chin et al., 2017), men, younger adults, and less educated participants all felt more bored, as did people who were unemployed. In contrast, longitudinal within-person changes in behavior (self-quarantining, crowd avoidance, handwashing, or staying home) did not reliably predict prospective changes in boredom.

More importantly, and surprisingly given previous work (e.g., Boylan et al., 2021; Brosowsky et al., 2021; Wolff et al., 2020), we also found no reliable longitudinal association in the other direction, as would be expected if boredom increased public health risk-taking. How bored people felt had no reliable prospective relationship to whether they self-quarantined, avoided crowds, stayed home, or washed their hands. Relative boredom (within-person) was not contemporaneously linked to quarantine, crowd avoidance, or handwashing; did not predict future quarantine status; and predicted future handwashing and crowd avoidance at only one (of three) timepoints. Furthermore, while people felt more bored than usual while staying home more than usual

Figure 5

Random-Intercept Cross-Lagged Panel Models (RI-CLPM) Depicting Boredom as a Longitudinal Predictor of Eudaimonic (i.e., Purpose in Life) and Hedonic Well-Being (i.e., Life Satisfaction, Happiness in Life)



* $p < .05$. ** $p < .01$. *** $p < .001$.

(i.e., significant contemporaneous relationships) at five of six timepoints, boredom predicted staying home prospectively at only one of those six timepoints. Nor were effects stronger for behaviors that restricted personal/social activities (e.g., self-quarantine) compared with behaviors that did not (e.g., handwashing). In summary, boredom did not predict future public health behavior for the majority of timepoints for the majority of behaviors.

Why did we not find longitudinal effects of boredom on public health behaviors, when other studies have found links between trait boredom and social distancing? One possibility is that lack of measurement precision led to null effects. However, while we did not observe within-person effects of boredom on social distancing and public health behaviors, we did replicate past observations of between-person effects (e.g., Boylan et al., 2021; Brosowsky et al., 2021; Wolff et al., 2020), such that people who (overall) reported elevated rates of boredom were also people who (overall) tended to report riskier public health behaviors. These effects can be observed in the significant correlations between the random intercepts for boredom and respective public health behaviors (see Figures 3 and 4). That these effects unfold *between*, but not *within* individuals, suggests that boredom is not driving such behavior. Disentangling between-person from within-person effects is a critical challenge in psychological research (Fisher et al., 2018). Just as faster typists make fewer mistakes (leading to a negative association between typing speed and errors *between* individuals), but typing slowly reduces mistakes (leading to a positive association between typing speed and errors *within* individuals), the factors that make people more prone to boredom may reduce the likelihood of complying with public health guidelines (i.e., leading to a negative association between trait boredom and public health compliance *between* individuals), even as increased boredom itself does not appear to predict reduced compliance *within* those same individuals.

We also saw little evidence that increases in pandemic boredom were related to declines in *hedonic* well-being (Figure 5). While feeling bored was contemporaneously linked to lower levels of life satisfaction (but not happiness), boredom did not predict *future* happiness or life satisfaction across time. This diverges from cross-sectional work linking pandemic boredom to greater stress, anxiety, depression, and lower life satisfaction (Chao et al., 2020; Deng et al., 2020; Olaigbe et al., 2021; Waterschoot et al., 2021), and boredom *proneness* to depression and anxiety (Yan et al., 2021). Effects for *eudaimonic* well-being were slightly stronger. Namely, there were small but significant effects within-person, such that people both felt more bored when experiencing low meaning in life (contemporaneously; consistent with Chao et al., 2020), and feeling bored now predicted small but significant prospective declines in meaning in life later across two of three timepoints. In summary, these results suggest that while boredom may co-occur with other negative affective states, it does not *necessarily* precede or produce them.

Beyond alleviating concerns about potential adverse effects of public health policies (e.g., lockdown), the present findings make two broader theoretical contributions. First, there is little longitudinal research assessing the impact of *state* boredom on behavior outside of the lab. How, exactly, emotion affects behavior has been the subject of considerable debate (e.g., Baumeister et al., 2007; Gendron & Barrett, 2009). A growing body of laboratory studies suggests that boredom plays a role in a wide variety of harmful behaviors, including intergroup bias, health risks such as alcohol and tobacco use, and willingness to harm one's self and others (Pfattheicher et al., 2021; van Tilburg & Igou, 2017). Yet, a growing (and contradictory) body of evidence finds that boredom also leads to positive outcomes in the lab, including creativity (Gasper & Middlewood, 2014) and prosocial behavior (van Tilburg & Igou, 2013). Thus, whether boredom is ultimately harmful or beneficial is unclear, in part because it is not known whether such effects extend beyond the lab, or what processes might moderate them. Using real-time self-reports from people experiencing the onset of a global pandemic, we found that while boredom was not uncommon, it was not particularly severe; nor did it appear to predict public health behavior, as previous research might expect.[7]

Such findings highlight the need for ecologically valid research on boredom and its behavioral consequences; just because boredom *can* (theoretically) produce certain outcomes in controlled laboratory settings does not mean it *will* produce such outcomes in the real world. While boredom may contribute to risk-taking when the stakes are low (such as in most lab studies to date), such temporary emotional states may cease to be a strong causal factor when the stakes are high, as when navigating the dangers posed by an unfolding global pandemic (see Cooper & Withey, 2009; for an analogous argument concerning the diminishing effects of personality under strong situational pressures). Some early cross-sectional evidence supports this interpretation: for instance, given the high real-world stakes, pandemic boredom may have prompted people to turn to other lower risk outlets, such as online leisure activities (Chen, 2020) or fantasizing (Caci et al., 2020), rather than flouting public health guidelines. While this raises another interesting possibility—that people might have completed the study itself due to boredom and (in doing so) inadvertently introduced self-selection biases, we found little evidence to this end. In fact, we found that the more bored people felt at the initial baseline survey, the *less* likely they were to participate in longitudinal follow-ups, $b = -.027$ (.001), $p < .001$, consistent with other evidence that boredom is generally bad for attrition (Westgate & Steidle, 2020). In summary, our findings contribute to a growing body of evidence that suggests there is no reliable one-to-one mapping between discrete emotions and their expression (e.g., Barrett et al., 2019; Baumeister et al., 2007), but rather that links between emotion and behavior depend heavily on contextual features of both the person and the situation.

Second, very little empirical research exists on *state* boredom (see Westgate & Steidle, 2020; for an overview), especially outside of American and Western European contexts. A strength of the present paper is its inclusion of a very large sample of participants from across the globe, including countries not historically well-represented in psychological research (e.g., Argentina, Indonesia, and the Philippines). Notably, we observed considerable cross-country variation in boredom, which was only partially accounted for by COVID-19 rates, lockdown policies, and GDP. Work by Lisa Feldman Barrett and others suggests that the conceptualization (and experience) of specific emotions is not universal, but rather culturally bounded (Barrett, 2009), and such variation is to be expected. Unfortunately, due to the use of single-item measures, we cannot test for measurement invariance, or rule out the possibility that differences in item interpretation

[7] Despite similar robust links in laboratory studies between novelty and boredom (e.g., Bench & Lench, 2019), Liang et al. (2020) likewise found actual experiences of novelty during the pandemic to be uncorrelated with self-reported state boredom.

or response styles contributed to country-level differences. In addition, it should be noted that not all samples were nationally representative, and as such, cannot yield precise country-level estimates. Hence, how and why boredom varies across countries is an important question for future research, especially given the present data suggesting that (like other emotions) there is not a single "universal" experience of boredom.

Finally, we wish to caution that we cannot conclude that the relationships we observed were causal. By untangling directional relationships over time, cross-lagged panel models (CLPM) represent an improvement upon cross-sectional analyses. Likewise, random-intercept cross-lagged panel models (RI-CLPM), such as those used here, represent an improvement upon traditional CLPM by disentangling within-person and between-person relationships. This analysis strategy allows us to look at the prospective effects of deviations from a person's mean level of a construct (i.e., feeling more bored than usual) by adjusting for individual differences in these constructs. However, effects may occur at timescales shorter than those assessed, and, as in any other nonexperimental methodology, measurement error limits our ability to fully control for confounds (e.g., Yarkoni & Westfall, 2017). Additional third variables beyond those measured may contribute to such relationships, and we caution that effects may not generalize to other types of preventive public health behavior, such as wearing masks.

Overall, despite concerns that public health policies intended to reduce the spread of infectious disease may be inadvertently exacerbating boredom and reducing their efficacy, we found very little evidence for extreme increases in "pandemic boredom" during the early COVID-19 outbreak in spring and summer of 2020 linked to such policies. Furthermore, longitudinal data suggests that increases in boredom (when they did occur) did not reliably lead to reduced adherence to public health guidelines meant to slow the spread of the virus (e.g., staying home, quarantining, and avoiding crowds). In short, boredom did not appear to constitute a serious threat to public health in the context of the ongoing COVID-19 pandemic.

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