Emotional experiences and psychological wellbeing in 51 countries during the COVID-19 pandemic

Abstract

The COVID-19 pandemic has brought significant challenges to individuals' wellbeing around the world. It is therefore essential to gain insight into the factors that are associated with better and poorer psychological wellbeing during this pandemic and other collective crises. In three studies, we examine the role of momentary emotional experiences for wellbeing during the prolonged stress of the COVID-19 pandemic. Study 1 used survey data collected from 26,684 participants in 51 countries during the COVID-19 outbreak. We show that, across countries, wellbeing is linked to individuals' recent experiences of specific positive and negative emotions, including calm, hope, anxiety, loneliness, and sadness. Consistent results are found in two representative samples with pre-registered analyses (Study 2). A prospective 30-day daily diary study confirms the key role of these five emotions, and demonstrates that emotional experiences precede changes in wellbeing (Study 3). Our findings highlight differential relationships between specific types of momentary emotional experiences and wellbeing, and point to the cultivation of calm and hope as candidate routes for wellbeing interventions during periods of sustained stress.

Keywords: emotion, wellbeing, stress, COVID-19 pandemic

Significance

Sustained stress strains wellbeing, and momentary emotional experiences can further help or hinder flourishing during challenging periods. Here, we examine the role of recent experiences of a wide range of specific positive and negative emotions for wellbeing during the prolonged stress of the COVID-19 pandemic. We show that wellbeing is linked to momentary experiences of calm, hope, anxiety, loneliness, and sadness. These findings highlight differential relationships between specific types of momentary emotional experiences and wellbeing, and point to the cultivation of calm and hope as candidate routes for wellbeing interventions during stress.

The COVID-19 pandemic constitutes a significant challenge to wellbeing. Pandemics, including this one, are linked to substantive deteriorations in mental health (Aknin et al., 2021; Wasserman, 1992). It is therefore essential to gain insight into the factors associated with better and worse wellbeing during periods of collective stress (Holmes et al., 2020). Here, we conduct a large-scale examination of a key factor for wellbeing: momentary emotional experiences.

Psychological wellbeing reflects both stable and temporary features, including satisfaction with life (hedonic wellbeing), a sense of purpose and meaning in life (eudaimonic wellbeing), resilience, and mental and physical health (Diener et al., 1985; Fletcher & Sarkar, 2013; Ryff & Singer, 2008; World Health Organization, 2004). Many factors that contribute to wellbeing tend to remain relatively consistent over time, and are difficult to change (Eid & Diener, 2004). These include both individual-level factors like income, and society-level factors like country-level wealth and inequality. Yet in addition to such relatively static factors, wellbeing is also affected by transient states that fluctuate considerably (Houben et al., 2015). Of particular importance to wellbeing is one's recent emotional experiences. Unsurprisingly, experiencing less negative and more positive emotions in one's daily life is associated with enhanced wellbeing (Huppert, 2009). However, emotions are generally experienced as being of different kinds (Barrett, 2012): we do not just feel good, we feel triumphant or determined or calm. Similarly, we typically experience feeling bad as one of a variety of flavors: we might feel angry, or sad, or lonely. In addition to differences in subjective experience, recent work has demonstrated that emotions that share the same valence (i.e., feeling positive or negative) can have different – and sometimes even opposite – effects on behavior (e.g., Kleef, 2010; Pressman & Cross, 2018). For example, we do not tend to feel or behave in the same way when we are proud and when we are grateful, nor when we are angry and when we are bored. These differences between emotions in terms of experience and behavior may result in differentiable relationships with wellbeing. In the present work, we test this prediction empirically.

To date, research on the relationship between emotions and wellbeing have tended to collapse across all negative and positive emotions, or alternatively, to examine a single emotion. For example, the majority of interventions focusing on altering emotional experience have sought to broadly increase positive and decrease negative affect (King, 2008). Studies that have attempted to enhance wellbeing via specific emotions have primarily targeted negative emotions, especially anxiety (MacLeod & Clarke, 2015) and loneliness (Masi et al., 2010). More recent work has specifically attempted to increase specific positive emotions, especially gratitude (Alkozei et al., 2018; Emmons & McCullough, 2004) and (self-)compassion (Barnard & Curry, 2011). The literature on emotion interventions shows some promise for such interventions as a route to enhancing wellbeing (Moskowitz et al., 2020). However, there is a dearth of evidence on the relative contributions of specific emotions to wellbeing (but see Barrett-Cheetham, Williams, & Bednall, 2016). Without examining multiple emotions at the same time, we cannot not know whether the absence of anxiety or sadness matters more than the presence of gratitude or feelings of calm. Understanding the relative contributions of specific types of emotional experiences to wellbeing is key to guiding individual and societal efforts to enhance wellbeing. This is of particular importance in the context of chronic collective stress, which strains individual as well as structural support resources. Conditions of generalised stress are likely to become more frequent: Not only is the COVID-19 pandemic expected to continue to affect large parts of the world's population for years to come (Kissler et al., 2020), but other large-scale collective crises are predicted to occur intermittently due to climate change (Zhang et al., 2011).

Here, we heed calls to go beyond the one-size-fits-all approach of positive and negative affect (Kirby, Tugade, & Shiota, 2014; Sauter, 2010) to examine which specific types of emotional experiences contribute to wellbeing during a period of collective, sustained stress. To answer this

question, we conducted three studies during the early phase of the COVID-19 pandemic. Study 1 consisted of survey data collected in 50 languages from 24,221 participants from 17 April to 15 May, 2020. Analyses were based on data from 51 countries, each with at least 200 participating individuals. We first summarize the overall patterns of emotional experiences and wellbeing, and then present the results of the emotional experiences-wellbeing relationship conducted using multilevel regression analysis. We also present robustness tests of our findings using fixed effects analysis, as well as exploratory structural equation modelling (ESEM), split sample test-retest, and zero-order correlations, demonstrating the solidity of our findings. In Study 2, we sought to replicate these exploratory findings with pre-registered analyses of two representative national samples from the United Kingdom and United States. In Study 3, we probe the temporal effect of the relationship between differential emotional experiences and subsequent wellbeing with data from a prospective 30-day diary study conducted in the United Kingdom. Together, these studies provide the first investigation into the relationships between a wide range of different types of momentary emotional experiences and psychological wellbeing.

Study 1. Emotions and wellbeing in 51 countries during the COVID-19 pandemic

Method

Participants. The study received ethical approval (Reference: 2020-SP-12098) from the ethics review board of the Department of Social Psychology, **masked university for peer review**. All participants consented to taking part in the study. The survey was translated into 50 languages, with each translation done by a native speaker and verified by at least one additional native speaker to ensure translation validity. Participants were recruited via media (e.g., newspapers), personal networks, and social media, including targeted group adverts. The full dataset is shared on OSF (<https://osf.io/s5puc/>); interactive illustrations are available at <https://covidemotions.shinyapps.io/shinymap/>. Beyond the questions addressed here, we hope that these data will provide a useful resource for researchers interested in psychology, health, and public policy within and across countries during periods of collectively elevated stress.

A total of 29,744 participants from 157 countries took part in the study. To ensure representativeness, we focused our analyses on data from countries with at least 200 participants, leaving 26,684 participants from 51 countries. These participants contributed at least one effective answer to the survey. To remove potentially careless answers, we excluded participants based on the following criteria: participants were removed if (a) their average response time was shorter than 2 seconds per item, or (b) they provided 11 or more consecutive identical answers to the emotion questions, or (c) they had 11 or more missing values out of the 20 emotion questions (Curran, 2016; Huang et al., 2012). Data from 24,221 participants were retained. The dataset from Iran only contained 195 participants after data cleaning. However, given the dearth of research on emotions and wellbeing in Iran, we nevertheless included this sample in the analysis. For all statistical models, we applied a listwise removal strategy; consequently, the number of observations differs across models. The number of observations in each model is reported in each results table. Participants were between 16 and 101 years old (mean age: 37.20, SD = 14.16). Participants' demographic information in each country is reported in Supplementary Materials Table S1.

Materials. We sought to broadly sample specific positive and negative emotions that could potentially be relevant to wellbeing. Emotional experiences were measured using the question: "In the past week, to what extent did you experience the following emotions? (Not at all = 0; Very much=6)", for the 20 emotions admiration, calm, compassion, determination, feeling moved, gratitude, hope, love, relief, sensory pleasure (such as smell, sound, touch etc), anger, anxiety/worry, boredom, confusion, disgust, fear, frustration, loneliness, regret, and sadness. Note that although the measure concerns experiences during the period of a week, the target emotional experiences are typically brief.

We sought to assess wellbeing broadly, including both negative and positive facets. Based on previous research, ten items were used to measure wellbeing: two questions measuring resilience, two questions measuring eudaimonic wellbeing (flourishing), one question measuring satisfaction with life, and one item each measuring stress, tiredness, depression, mental health, and physical health (Block & Block, 1980; Diener et al., 1985; Ryff, 1989; Wilson & Cleary, 1995). Participants were instructed to indicate their wellbeing in the present moment. Detailed information on the wellbeing measures can be found in the Supplementary Materials “Study 1 Wellbeing measures” section.

Control Variables. When testing the relationships between momentary emotional experiences and wellbeing, we took into account several stable features that are relevant to psychological wellbeing: age, gender, education, and subjective socioeconomic status (SES). Specifically, younger individuals, women, and those with less education have been shown to experience more stress and reduced wellbeing during the COVID-19 pandemic (Kowal, Coll-Martín, Ikizer, Rasmussen, Eichel, Studzińska, et al., 2020), and people with lower SES have been found to be disproportionately influenced by COVID-19, including in terms of mental health (Patel et al., 2020).

We also included three domains of country-level features: COVID-19-related measures (COVID-19 related deaths, government policy stringency), global indices (GDP and Gini Index), and cultural values (collectivism, individualism, tightness/looseness). The number of COVID-19 related deaths per million was used as an index of the severity of the outbreak in each country. Policy stringency was included because laxer policy measures in relation to the COVID-19 pandemic have been found to be associated with higher levels of psychological distress (Hensel et al., 2021; Jacobson et al., 2020). We also took into account country-level wealth (GDP) and inequality (Gini Index), because people in more affluent countries are on average happier than those in poorer countries (de Neve et al., 2018), and economic inequality is generally associated with worse wellbeing (Okulicz-Kozaryn & Mazelis, 2017). Finally, we included measures of cultural norms and values: collectivism/individualism (the extent to which the self is primarily seen in relation to the group (Triandis, 1989) and tightness/looseness (the strength of and adherence to social norms) (Gelfand et al., 2011), as they have been found to be associated with wellbeing (Gelfand et al., 2021; Harrington et al., 2015).

Analyses and Results

Assessing the wellbeing factor structure. We first assessed the underlying factor structure of the wellbeing measures by conducting an exploratory item factor analysis (Wirth & Edwards, 2007) using Mplus 8.4 (Muthén & Muthén, 2017). Items with less than 10 response categories were treated as ordered categorical variables. Exploratory item factor analysis suggested that the four-factor model attained sufficiently good fit (CFI = 0.98, RMSEA = 0.03, SRMR = 0.01). The four factors, each of which was defined by the items in the subsequent parenthesis, were labelled *Wellness* (both eudaimonic items and satisfaction with life), *Resilience* (both resilience items), *Health* (the mental health item and physical health item), and *Distress* (the items measuring stress, tiredness, and depression). The magnitude of inter-factor correlations ranged from 0.37 to 0.74. The Cronbach’s Alpha of Wellness, Resilience, Health and Distress were 0.83, 0.82, 0.74, and 0.82, respectively. Further details on the factor structure can be founded in the Supplementary Materials Tables S4-S5.

Descriptive Information. These data offer a rich, granular map of the emotional experiences and wellbeing of 24,221 participants from 51 countries during a period of high chronic stress. We found that overall, emotional experiences of love, compassion, hope and gratitude were common in participants’ daily life (Figure 1A, Figure 2), as were feelings of

anxiety, boredom, frustration, and sadness (Figure 1B, Figure 2). As can be seen in Figures 2 and 3, the average self-reported score was higher for positive emotions (mean = 3.53, SD = 1.03) as compared to negative emotions (mean = 2.67, SD = 1.34), indicating that even during a period of sustained high stress, people on average experience more positive than negative emotions in their daily lives. Wellbeing levels per country are shown in Figure 4 (see also Figure S6 for medians and 25% - 75% quantiles), and detailed descriptive statistics of participants' demographic information, emotion, and wellbeing scores by country are reported in Supplementary Materials Tables S1-S3.

Model Setup. Because of the data structure with individuals (Level 1) being nested in countries (Level 2), we employed multilevel regression models to test which emotions would predict wellbeing during the COVID-19 pandemic. Each of the wellbeing outcomes was first analyzed with an unconditional means model (i.e., a model with no predictors) to estimate within- vs between-country variance. Some variability was found across countries for all four facets of wellbeing (see Figure 4) with 4-7% of the variability explained by variance between countries, justifying the usage of multilevel models. Intraclass correlation coefficients per wellbeing outcome are displayed in Table S6. Regression analyses were conducted separately for each of the four wellbeing facets as outcomes. Level 1 predictors were standardized using grand mean and grand standard deviation; Level 2 predictors were standardized across the 51 countries before they were entered into the models.

In the first step of the multilevel regression models, the demographic variables age, gender, education, and SES were included as Level 1 fixed-effect control variables, with country (Level 2) as random intercept. In the second step, we added the 20 emotions at the same time into the model as fixed-effect predictors; since all 20 emotions were added simultaneously, the regression coefficients are “partial” effects that gauge the unique contribution of each predictor (the non-partial relationships are reported as zero-order correlations; see the Further analyses section below). The variance inflation factors were below 5 for all models, indicating that there were no issues of multicollinearity. We then allowed independent random slopes for all 20 emotions in each model, that is, we allowed the emotion – wellbeing relationship to be different in each country. Adding random slopes of the emotions significantly improved the models. See Supplementary Materials Tables S7-10 for statistical details.

Primary results - Distinct emotions and wellbeing. Substantial variance of wellbeing was explained by the control variables and the 20 emotions (Wellness: 51.8%; Resilience: 35.6%; Health: 35.9%; Distress: 50.6%). Many emotions were statistically significant predictors of wellbeing, thanks to the large sample size. We therefore focus on emotions with standardized coefficients above 0.05 (Funder & Ozer, 2019) as the most important emotions for wellbeing. The results are visualized in Figure 5, illustrating the extent to which experiences of different types of emotions predict each facet of wellbeing. The key positive emotions were *calm*, *hope*, *determination*, and *love*, which were all positively associated with Wellness, Resilience, and Health. Calm and hope were also negatively associated with Distress. The key negative emotions relating to wellbeing were *anxiety*, *frustration*, *loneliness*, *regret*, and *sadness*, which were all negatively associated with Wellness and Health, and positively associated with Distress. Regret, sadness, and fear were also negatively associated with Resilience. These results provide support for the notion that emotions differentially relate to wellbeing.

Control variables and wellbeing. In line with other work (Aknin et al., 2021), we also found that women, younger individuals, and people with lower education and lower subjective SES had poorer wellbeing during the present pandemic (Tables S7-S10). For country-level variables, no significant effects were found beyond individual level predictors for GDP or economic inequality (Table S9), nor for number of deaths (Table S9) or cultural values (Table S10). In line with Hensel et al. (2021), we found that living in countries with more stringent measures in relation to COVID-19 was associated with higher Resilience and less Distress when holding other predictors constant (see Supplementary Materials Table S9 for full statistical details).

Further analyses. To test the robustness of our findings, we additionally used a fixed effect approach to verify the multilevel regression results (Möhring, 2012), and to examine the cross-country (in)consistencies of the emotion-wellbeing relationships (note: the fixed effect approach is different from fixed-effect in multilevel regression models). We found that calm, hope, and sadness displayed high cross-country consistency: the relationship between these emotions and wellbeing outcomes was in the same direction for all 51 countries. Substantial cross-country consistency was found for several additional emotions: For three out of four wellbeing outcomes, determination, love, loneliness, and regret were also consistent across all countries. The fixed effect approach results are reported in Table S11, and we summarize the cultural consistency results in Table S12.

We also conducted robustness tests of our findings using exploratory structural equation modelling (ESEM), and split sample test-retest. We conducted ESEM in order to examine whether the key emotions form reasonable factors in predicting wellbeing facets. The ESEM results yielded analogous findings to those from the regression models. The results suggested that calm, determination, and hope (Emotion Factor 2) positively predicted Wellness ($\beta = 0.54$), Resilience ($\beta = 0.86$), and Health ($\beta = 0.35$). Anxiety, fear, sadness, and calm (reverse scored) (Emotion Factor 3) positively predicted Distress ($\beta = 0.25$). Calm and relief (Emotion Factor 7) negatively predicted Distress ($\beta = -0.23$). Frustration, loneliness, regret, and sadness (Emotion Factor 8) negatively predicted Wellness ($\beta = -0.34$) and positively predicted Distress ($\beta = 0.23$).

To further test the reliability of the results, we re-ran the multilevel analyses using a split sample test-retest approach. We randomly selected half of the participants from each country as a test sample and the other half as a re-test sample. The estimated parameters and variance explained by the test and re-test models were highly consistent, further attesting to the robustness of the results. Detailed model fit as well as visualizations can be found in Figures S1-S5 in Supplementary Materials.

Finally, we conducted zero-order correlation analyses. In our original analyses, all 20 emotions were entered into the models at the same time, meaning that the regression coefficients were "partial" effects that gauged the unique contribution of each predictor. In order to test the relationship between each individual emotion and wellbeing facet without controlling for the other emotions, we ran zero-order correlations using Pearson correlation tests. The results of the zero-order correlations largely replicated the findings from the multilevel analyses. In particular, calm, determination, and hope were positively related to wellbeing, while anxiety, loneliness, frustration, and sadness were negatively related to wellbeing (in all of these cases, at least two out of four wellbeing facets had $r > .35$; see Supplementary Materials Table S14 for all results).

In sum, the results from the ESEM, split sample test-retest, and zero-order correlations largely replicated our findings; full details can be found in the Supplementary Materials Further analyses section.

Study 1 Discussion

Using a large-scale multi-country dataset collected during the outbreak of the COVID-19 pandemic, we conducted an exploratory test of the prediction that different types of momentary emotional experiences would differentially relate to psychological wellbeing. We examined 10 positive and 10 negative emotions and tested their relationship with both positive and negative aspects of psychological wellbeing. Four key positive emotions (calm, hope, determination, and love), and five key negative emotions (anxiety, frustration, loneliness, regret, and sadness) were found to be particularly strong predictors of psychological wellbeing. Moreover, calm, hope, determination, love, loneliness, regret, and sadness displayed high cross-country consistency in their relationships with psychological wellbeing, suggesting that these associations generalize across

cultural contexts. These findings provide initial empirical evidence that specific types of momentary emotional experiences are key to psychological wellbeing. As a next step, we sought to verify these findings in a pre-registered replication.

Study 2. Pre-registered analysis with representative samples

Study 1 was exploratory in nature, and participants were recruited predominantly via the snowballing method, meaning that the samples were neither representative nor gender balanced. We therefore sought to test the robustness of the patterns of results from Study 1 in a pre-registered replication with two independent, representative samples (<https://aspredicted.org/blind.php?x=ps3su9>).

We asked participants in two representative samples to report on their momentary emotional experiences and their wellbeing. Study 2 allowed us to test the replicability of the findings that feelings of calm, determination, love, and hope would be positively related to positive indices of wellbeing (Wellness, Resilience, and Health) and negatively associated with negative indices of wellbeing (Distress), and that experiences of anxiety, frustration, sadness, and loneliness would be negatively related to positive indices of wellbeing and positively associated with negative indices of wellbeing¹.

Method

Participants. Study 2 received the same ethical approval as in Study 1. Two samples that were representative² in terms of age, gender, and ethnicity were recruited through the research survey panel Prolific.co. One sample was recruited from the United Kingdom (UK) and one from the United States (US), with the aim to sample 1000 participants in each. The data was collected from May 14 to 19, 2020, during the outbreak of the first wave of the COVID-19 pandemic in the UK and the US. The materials in Study 2 were the same as in Study 1.

Following the application of our pre-registered data cleaning criteria, 971 UK participants (Mean_{age} = 46.91, SD_{age} = 15.72; 508 women) and 961 US participants (Mean_{age} = 45.92, SD_{age} = 16.28; 494 women) were retained in the analyses.

Analyses and Results

Assessing the wellbeing factor structure. Following our pre-registered analysis plan, we first assessed the wellbeing factor structure. Parameter estimation was configured like the one applied in the analysis of the data in Study 1, except that no adjustment for cluster sampling was needed. The same 4-factor structure as in Study 1 was found in the UK representative sample (CFI = 0.99, RMSEA = 0.08, SRMR = 0.01) and the US representative sample (CFI = 0.99, RMSEA = 0.07, SRMR = 0.01). We pre-registered a 2-factor wellbeing structure based on analyses of part of the global dataset. However, the 4-factor wellbeing structure had better model fit for both the dataset in Study 1 and these two pre-registered datasets and was therefore adopted. Detailed analysis methods and comparisons of factor structures are reported in Supplementary Materials Section B “Factor analysis for wellbeing outcomes” and in Table S16.

Descriptive Information. Descriptive statistics of participants’ emotional experiences and wellbeing are reported in Table S15 (B).

Primary results - Distinct emotions and wellbeing. We followed the pre-registered analysis plan, first adding individual-level control variables into the models, and then the 20 emotions. The

¹ When we formulated the pre-registration, approximately half of the data had been collected for Study 1. We ran preliminary analysis of 20 emotions and wellbeing using regression analysis based on the partial data in Study 1. In the results of the preliminary analysis, regret was not one of the key emotions. Therefore, we did not hypothesize a key role for regret in Study 2.

² Prolific uses quota sampling, which is a non-probability sampling method. There is thus no guarantee that the sample is representative of the general population in terms of other features than those reported here.

results from both the UK and US representative samples provide clear, consistent support for the majority of our predictions based on Study 1. Specifically, for six of the eight emotions that we hypothesized to be main predictors of wellbeing (calm, determination, hope, anxiety, loneliness and sadness), we found converging evidence with Study 1 in both the UK and US. Specifically, calm and determination positively predicted Wellness, Resilience, and Health; hope positively predicted Wellness and Resilience; anxiety, loneliness and sadness negatively predicted Wellness, Resilience and Health; calm and hope negatively, and anxiety, loneliness and sadness positively, predicted Distress. Detailed results can be found in Supplementary Materials Table S18.

However, we did not find evidence for key roles of momentary experiences of love or frustration for wellbeing in the representative samples. Moreover, in the pre-registration, we did not predict regret to be an emotion that would be especially important for wellbeing, but we found that feelings of regret predicted all four wellbeing outcomes in the US sample and two wellbeing outcomes in the UK sample (Wellness and Distress).

Control variables and wellbeing. Across the UK and the US samples, participants with higher SES reported enhanced psychological wellbeing (Wellness, Resilience, and Health). We did not find age to relate to psychological wellbeing. Finally, we found some gender differences: compared to women, men reported lower Distress (in the UK sample) and higher Resilience (in the US sample). Detailed analyses and results are reported in Supplementary Results Tables 18-20.

Study 2 Discussion

Study 2 employed pre-registered hypotheses and analyses, applied to two representative samples, to test the robustness of the specific emotion-wellbeing relationships found in Study 1. The results provide support for most of the predicted relationships. Specifically, we found that momentary experiences of calm, determination, hope, anxiety, sadness, and loneliness were, as hypothesised, key emotions for both positive and negative elements of wellbeing in the two representative samples. However, we did not find support for love and frustration being key predictors of psychological wellbeing in Study 2. Overall, the consistency of the results between the two representative samples, as well as with the results from Study 1, suggest that the links between specific types of emotional experiences and wellbeing that were established in Study 1 are robust.

Study 3. Testing a temporal relationship between emotions and wellbeing

Studies 1 and 2 provide clear support for differential relationships between experiences of particular types of emotions and wellbeing. Our theorizing conceptualizes the emotional experiences as shaping subsequent wellbeing, but in Studies 1 and 2, the measures of emotions and wellbeing were collected concurrently, precluding conclusions about their temporal relationship. For emotional experiences to predict subsequent wellbeing, the emotional experiences must precede the changes in wellbeing. In order to empirically test this notion, we examined the temporal relationship between emotional experiences and wellbeing using existing data from a 30-day daily diary study conducted between April and June 2020.

Method

Participants. The study received ethical approval (Reference: 2020-SP-12027) from the Ethics Review Board of the Department of Social Psychology, **masked university for peer review**. All participants consented to taking part in the study. Participants were recruited via personal networks and social media, including targeted group adverts. A total of 140 participants residing in the United Kingdom took part in the study between April 10 and June 9, 2020. Data from 110 participants (55 women, 53 men, 2 other) were retained in the analyses. Participants' mean age was 37.98 years (SD = 12.83, range 18 to 71 years).

Study procedure. The study was conducted in four phases. In the first part, participants gave informed digital consent and answered demographic questions. The second phase was a pre-diary questionnaire in which participants answered questions about stable traits, such as personality. The third phase was the 30-day diary study, during which participants answered a short (~10 minutes) daily online questionnaire each evening, shortly before going to bed. We asked participants to indicate the intensity of their emotional experiences for 29 different positive and negative emotions for that day. Of the 29 emotions measured, 17 overlapped with those tested in Studies 1 and 2 (frustration, regret and confusion were not tested in the diary study). Participants also reported their end-of-day wellbeing, with wellbeing measures identical to those used in Studies 1 and 2. In the final phase, which was completed after the 30-day diary period, participants reported additional person-level traits, as well as completing the same battery of questionnaires as in the pre-diary phase.

Analyses and Results

Assessing the wellbeing factor structure. To confirm that the factor structure of wellbeing remained stable during the period of the daily diary study, we fitted a four-factor independent-cluster model in which the factor loading pattern was specified to the data of Days 1, 8, 15, and 22, in accordance with the EFA analysis reported in Studies 1 and 2. Results suggested that the four-factor wellbeing structure used in Studies 1 and 2 also fit the data well for this sample (see Supplementary Materials Table S21-S22 for details).

Emotional experiences and wellbeing. In order to test for a temporal relationship of emotional experiences and wellbeing, we used a lagged analysis with a rolling³ seven-day mean level of momentary emotional experience to predict wellbeing on the seventh day. The 17 emotions were added simultaneously into the multilevel regression models. We first fit models with only fixed effects and then added random effects (i.e., allowing the emotion-wellbeing relationship differ between participants) for all Level 1 predictors. As the models failed to converge when random effects were allowed to correlate, we made the simplification of including independent random effects. We also added participants' SES, age, and gender in Level 2. As standardization is not advised in longitudinal studies (Moeller, 2015), we report unstandardized coefficients.

The results were consistent with the findings from Studies 1 and 2. As predicted, we found that the extent to which an individual had experienced momentary feelings of calm, hope, anxiety, loneliness, and sadness during the past week predicted their subsequent wellbeing. Specifically, calm positively predicted Wellness, Resilience, and Health, and negatively predicted Distress; hope positively predicted Health; anxiety negatively predicted Wellness, Resilience, and Health, and negatively predicted Distress; loneliness negatively predicted Health and positively predicted Distress; sadness negatively predicted Wellness and Resilience, and positively predicted Distress. In addition, anger was found to negatively predict Wellness and Health, and boredom was found to negatively predict Wellness and Resilience; neither anger nor boredom were key emotions in Studies 1 and 2. Detailed results are reported in Supplementary Table S23.

Control variables and wellbeing. In Study 3, we found that men reported better wellbeing (higher Wellness and lower Distress) than women. Participants with higher SES also reported higher wellbeing (Wellness and Health). We did not find a relationship between age and wellbeing outcomes, likely due to the relatively small sample size.

Study 3 Discussion

The results from Study 3 provides insights about the temporal relationship between emotional experiences and wellbeing. Consistent with Studies 1 and 2, several types of specific positive as well as as negative experiences were found to relate to wellbeing. The longitudinal data provide a more conservative indication of which emotions predict wellbeing. Notably, however, the emotions that

³ Here, the rolling mean refers to the mean level of the emotions during days 1-7, 2-8, 3-9, and so on.

predicted subsequent wellbeing in the prospective diary study were consistent with the key emotions in Studies 1 and 2. These findings point to a particularly important role of momentary feelings of calm, hope, anxiety, loneliness, sadness, and anger for wellbeing even one week later. It is worth noting that although these data are longitudinal, they are not experimental, and so causal relationships cannot be established.

General Discussion

In three studies (total $N = 28,726$), we examined the role of specific types of emotional experiences for wellbeing during the COVID-19 pandemic, demonstrating a uniquely important role for recent momentary experiences of calm, hope, anxiety, loneliness, and sadness. These emotional experiences may thus constitute particularly promising targets for individual and policy interventions for increasing wellbeing during sustained, collective stress. Notably, our results were largely homogenous across the countries in our samples, suggesting that these links are consistent across cultural contexts.

These studies present a large-scale examination of the unique roles of a wide range of distinct emotional experiences for psychological wellbeing during the global crisis of the COVID-19 pandemic. Importantly, we examined both positive and negative aspect of wellbeing, in order to understand not only what increases psychological distress during challenging periods, but also to examine protective functions in terms of wellness, resilience, and health. Our findings demonstrate that psychological wellbeing is primarily linked to recent momentary experiences of calm, hope, anxiety, loneliness, and sadness. These results held across different analytical approaches, were consistent across countries, and were replicated in two representative samples using pre-registered analyses, as well as in a prospective 30-day daily diary study. These emotions are thus the strongest candidates for constituting key emotional experiences for psychological wellbeing. Why might these particular of emotional experiences play such a key role for wellbeing during high chronic stress?

Experiences of calm reflect activation of the parasympathetic nervous system (Porges, 2007), which allows for psychological and physiological recovery from stress (Fredrickson et al., 2008). The benefits of feeling calm appear to be intuitively recognized by people living through the COVID-19 pandemic, as evidenced by a global surge in downloads and use of meditation apps during the outbreak (Lerman, 2020). Research in clinical and positive psychology suggests potential promise for interventions targeting calm to increase wellbeing (Baumeister & Vohs, 2002; Sin & Lyubomirsky, 2009). One route to calm may be to spend time in nature, which is associated with enhanced wellbeing, especially at times of crisis (Bratman et al., 2012, 2019).

In contrast, feelings of anxiety and sadness were consistently linked to worse psychological wellbeing. Prolonged or frequent anxiety or sadness can indicate risk for developing chronic mental health problems, especially during periods of social distancing (Vinkers et al., 2020). Because of the nature of the pandemic, people around the world have been instructed to stay at home and physically distance from others, thus precluding many social strategies for handling stress (Torales et al., 2020). Interventions promoting calm may ameliorate anxiety, given that calm and anxiety have been proposed to reflect two end points of a bipolar continuum (Siddaway et al., 2018). In the present study, the zero-order correlations between calm and anxiety were indeed negative and moderately strong (see Supplementary Table S14), although they mapped onto different facets of wellbeing (calm was most consistently related to wellness and anxiety most consistently related to distress).

We also found that individuals who experienced more loneliness reported poorer psychological wellbeing, a result that is consistent with previous research (Hawkley & Cacioppo, 2010). Social relationships play an important role in mental and physical health

(Hawkley & Cacioppo, 2010; Proulx et al., 2007), with feelings of loneliness indicating an absence of social resources available to us for support (Taylor, 2006). The present finding that loneliness plays a pivotal role in psychological wellbeing during the COVID-19 pandemic emphasizes the crucial importance of social connections whilst practicing physical distancing (Wu et al., 2021). Technology-mediated interactions may offer a partial remedy for the loss of face-to-face interactions (Sun et al., 2020).

Finally, we found that recent momentary feelings of hope were associated with better wellbeing. Hope helps individuals orient to opportunities in the environment (Hood et al., 2012), and can aid resilience during challenges (Rutter, 1993). The present findings go beyond the well-established role of hope in clinical depression (Snyder, 1999, 2004) and point to a broader role of hope as a protective mechanism against stress. These findings align with research on wellbeing interventions focused on hope, which show some promise, particularly in the context of high stress (Dugleby et al., 2007; Lopez et al., 2000).

In line with previous research, stable demographic factors also mapped onto wellbeing, with women, younger individuals (in Study 1), and people with fewer years of education reporting poorer wellbeing during the pandemic (Kowal, Coll-Martín, Ikizer, Rasmussen, Eichel, Studzinska, et al., 2020; Sun & Sauter, 2021; Wade, 2020). Low-SES individuals in our samples also reported worse wellbeing during the pandemic, consistent with research demonstrating increased risk of stress-related negative outcomes in low-SES groups (Adler et al., 1994). Low-SES groups have suffered disproportionately high infection and mortality rates during COVID-19, as well as in earlier epidemics and pandemics (Caul, 2020; Wade, 2020; Wadhwa et al., 2020). Together, these findings highlight the stressors relating to both financial and health strains in lower SES communities, women, and younger individuals, especially at times of crisis. Our results thus point to the importance of considering demographic factors when policy makers introduce interventions and allocate support.

It is worth noting that these results are remarkably uniform across countries. In the multilevel regression analyses in Study 1, several sets of cultural norms (individualism, collectivism, tightness/looseness) were not found to significantly predict psychological wellbeing above and beyond emotional experiences. Moreover, using fixed-effect analysis, we found that four out of the five key emotions were consistent across at least three of the four wellbeing facets: calm, hope, loneliness and sadness (anxiety predicted two wellbeing outcomes consistently across countries). Together, this suggests strong cross-cultural consistencies in the role of emotional experience on wellbeing, at least during chronically elevated stress.

The present study was conducted during the COVID-19 pandemic, and thus provides an account of the role of specific types of emotional experiences for wellbeing during chronic stress. Further work will be needed to determine the extent to which these relationships are found also in the contexts of other types of stressors, including more short-term challenges. Moreover, it remains to be established whether these specific emotions are as important during periods of low stress.

Across three studies, we found that individuals' recent momentary experiences of five specific emotions are particularly crucial for predicting psychological wellbeing. However, this does not imply that emotions and wellbeing are a personal responsibility (Davies, 2015; Vinkers et al., 2020). Responding to the collective crisis of the COVID-19 pandemic will thus require not only individuals, but also organizations and public institutions to create opportunities for momentary experiences of calm and hope, and interventions to tackle anxiety, sadness, and loneliness.

- Adler, N. E., Boyce, T., Chesney, M. A., Cohen, S., Folkman, S., Kahn, R. L., & Syme, S. L. (1994). Socioeconomic status and health: The challenge of the gradient. *American Psychologist*, 49(1), 15–24. <https://doi.org/10.1037/0003-066X.49.1.15>
- Aknin, L., De Neve, J.-E., Dunn, E., Fancourt, D., Goldberg, E., Helliwell, J., Jones, S. P., Karam, E., Layard, R., & Lyubomirsky, S. (2021). *A review and response to the early mental health and neurological consequences of the COVID-19 pandemic*.
- Alkozei, A., Smith, R., & Killgore, W. D. S. (2018). Gratitude and subjective wellbeing: A proposal of two causal frameworks. *Journal of Happiness Studies: An Interdisciplinary Forum on Subjective Well-Being*, 19(5), 1519–1542. <https://doi.org/10.1007/s10902-017-9870-1>
- Barnard, L. K., & Curry, J. F. (2011). Self-Compassion: Conceptualizations, Correlates, & Interventions. *Review of General Psychology*, 15(4), 289–303. <https://doi.org/10.1037/a0025754>
- Baumeister, R. F., & Vohs, K. D. (2002). The pursuit of meaningfulness in life. *Handbook of Positive Psychology*, 1, 608–618. <http://homepage.psy.utexas.edu/HomePage/Class/Psy418/Josephs/Wynne Folder/44-Meaningfulness in Life.pdf>
- Block, J. H., & Block, J. (1980). The role of ego-control and ego-resiliency in the organization of behavior. *Development of Cognition, Affect and Social Relations. The Minnesota Symposia on Child Psychology*, 39–101. <https://doi.org/10.4324/9781315803029-7>
- Bratman, G. N., Anderson, C. B., Berman, M. G., Cochran, B., De Vries, S., Flanders, J., Folke, C., Frumkin, H., Gross, J. J., & Hartig, T. (2019). Nature and mental health: An ecosystem service perspective. *Science Advances*, 5(7), eaax0903.
- Bratman, G. N., Hamilton, J. P., & Daily, G. C. (2012). The impacts of nature experience on human cognitive function and mental health. *Annals of the New York Academy of Sciences*, 1249(1), 118–136. <https://doi.org/10.1111/j.1749-6632.2011.06400.x>
- Caul, S. (2020). *Deaths involving COVID-19 by local area and socioeconomic deprivation*. Office for National Statistics. <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/deathsinvolvingcovid19bylocalareasanddeprivation/deathsoccurringbetween1marchand31may2020>
- Curran, P. G. (2016). Methods for the detection of carelessly invalid responses in survey data. *Journal of Experimental Social Psychology*, 66, 4–19. <https://doi.org/10.1016/j.jesp.2015.07.006>
- Davies, W. (2015). *The happiness industry: How the government and big business sold us well-being*. Verso Books.
- de Neve, J.-E. E., Ward, G., De Keulenaer, F., van Landeghem, B., Kavetsos, G., & Norton, M. I. (2018). The asymmetric experience of positive and negative economic growth: Global evidence using subjective well-being data. *Review of Economics and Statistics*, 100(2), 362–375. https://doi.org/10.1162/rest_a_00697
- Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction With Life Scale. *Journal of Personality Assessment*, 49(1), 71–75. https://doi.org/10.1207/s15327752jpa4901_13
- Duggleby, W. D., Degner, L., Williams, A., Wright, K., Cooper, D., Popkin, D., & Holtslander, L. (2007). Living with hope: initial evaluation of a psychosocial hope intervention for older palliative home care patients. *Journal of Pain and Symptom Management*, 33(3), 247–257.
- Eid, M., & Diener, E. (2004). Global judgments of subjective well-being: Situational variability and long-term stability. *Social Indicators Research*, 65(3), 245–277.
- Emmons, R. A., & McCullough, M. E. (2004). *The psychology of gratitude*. Oxford University Press.
- Fletcher, D., & Sarkar, M. (2013). Psychological Resilience. *European Psychologist*, 18(1), 12–23. <https://doi.org/10.1027/1016-9040/a000124>

- Fredrickson, B. L., Cohn, M. A., Coffey, K. A., Pek, J., & Finkel, S. M. (2008). Open hearts build lives: Positive emotions, induced through loving-kindness meditation, build consequential personal resources. *Journal of Personality and Social Psychology*, 95(5), 1045–1062. <https://doi.org/10.1037/a0013262>
- Funder, D. C., & Ozer, D. J. (2019). Evaluating Effect Size in Psychological Research: Sense and Nonsense. *Advances in Methods and Practices in Psychological Science*, 2(2), 156–168. <https://doi.org/10.1177/2515245919847202>
- Gelfand, M. J., Jackson, J. C., Pan, X., Nau, D., Pieper, D., Denison, E., Dagher, M., Van Lange, P. A. M., Chiu, C.-Y., & Wang, M. (2021). The relationship between cultural tightness–looseness and COVID-19 cases and deaths: a global analysis. *The Lancet Planetary Health*. [https://doi.org/10.1016/s2542-5196\(20\)30301-6](https://doi.org/10.1016/s2542-5196(20)30301-6)
- Gelfand, M. J., Raver, J. L., Nishii, L., Leslie, L. M., Lun, J., Lim, B. C., Duan, L., Almaliach, A., Ang, S., Arnadottir, J., Aycan, Z., Boehnke, K., Boski, P., Cabecinhas, R., Chan, D., Chhokar, J., D’Amato, A., Ferrer, M., Fischlmayr, I. C., ... Yamaguchi, S. (2011). Differences between tight and loose cultures: A 33-nation study. *Science*, 332(6033), 1100–1104. <https://doi.org/10.1126/science.1197754>
- Harrington, J. R., Boski, P., & Gelfand, M. J. (2015). Culture and national well-being: Should societies emphasize freedom or constraint? *PLoS ONE*, 10(6). <https://doi.org/10.1371/journal.pone.0127173>
- Hawkey, L. C., & Cacioppo, J. T. (2010). Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine*, 40(2), 218–227.
- Hensel, L., Witte, M., Caria, S., Fetzer, T., Fiorin, S., Goetz, F. M., Gomez, M., Haushofer, J., Ivchenko, A., Kraft-Todd, G., Reutskaja, E., Roth, C., Yoeli, E., & Jachimowicz, J. M. (2021). Global Behaviors, Perceptions, and the Emergence of Social Norms at the Onset of the COVID-19 Pandemic. *Journal of Economic Behavior & Organization*, 193, 473–496. <https://doi.org/10.1016/j.jebo.2021.11.015>
- Holmes, E. A., O’Connor, R. C., Perry, V. H., Tracey, I., Wessely, S., Arseneault, L., Ballard, C., Christensen, H., Silver, R. C., Everall, I., Cohen Silver, R., Everall, I., Ford, T., John, A., Kabir, T., King, K., Madan, I., Michie, S., Przybylski, A. K., ... Everall, I. (2020). Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. *The Lancet Psychiatry*, 7(6), 547–560. [https://doi.org/10.1016/S2215-0366\(20\)30168-1](https://doi.org/10.1016/S2215-0366(20)30168-1)
- Hood, A., Pulvers, K., Carrillo, J., Merchant, G., & Thomas, M. D. (2012). Positive traits linked to less pain through lower pain catastrophizing. *Personality and Individual Differences*, 52(3), 401–405.
- Houben, M., Van Den Noortgate, W., & Kuppens, P. (2015). The relation between short-term emotion dynamics and psychological well-being: A meta-analysis. *Psychological Bulletin*, 141(4), 901.
- Huang, J. L., Curran, P. G., Keeney, J., Poposki, E. M., & DeShon, R. P. (2012). Detecting and Deterring Insufficient Effort Responding to Surveys. *Journal of Business and Psychology*, 27(1), 99–114. <https://doi.org/10.1007/s10869-011-9231-8>
- Jacobson, N. C., Lekkas, D., Price, G., Heinz, M. V, Song, M., O’Malley, A. J., & Barr, P. J. (2020). Flattening the mental health curve: COVID-19 stay-at-home orders result in alterations in mental health search behavior in the United States. *JMIR Mental Health*, 7(6), e19347. <https://doi.org/10.2196/19347>
- King, L. A. (2008). Interventions for enhancing subjective well-being: Can we make people happier and should we? In *The science of subjective well-being*. (pp. 431–448). Guilford Press.
- Kissler, S. M., Tedijanto, C., Goldstein, E., Grad, Y. H., & Lipsitch, M. (2020). Projecting the transmission dynamics of SARS-CoV-2 through the postpandemic period. *Science*, 368(6493), 860–868.
- Kleef, G. A. Van. (2010). Don’t Worry, Be Angry? Effects of Anger on Feelings, Thoughts, and

- Actions in Conflict and Negotiation. In M. Potegal, G. Stemmler, & C. D. Spielberger (Eds.), *International Handbook of Anger* (pp. 545–559). Springer. <https://doi.org/10.1007/978-0-387-89676-2>
- Kowal, M., Coll-Martín, T., Ikizer, G., Rasmussen, J., Eichel, K., Studzińska, A., Koszałkowska, K., Karwowski, M., Najmussaib, A., & Pankowski, D. (2020). *Who Is the Most Stressed During COVID-19 Isolation? Data from 27 Countries*.
- Kowal, M., Coll-Martín, T., Ikizer, G., Rasmussen, J., Eichel, K., Studzińska, A., Koszałkowska, K., Karwowski, M., Najmussaib, A., Pankowski, D., Lieberoth, A., & Ahmed, O. (2020). Who is the Most Stressed During the COVID-19 Pandemic? Data From 26 Countries and Areas. *Applied Psychology: Health and Well-Being*, 12(4), 946–966. <https://doi.org/https://doi.org/10.1111/aphw.12234>
- Lerman, R. (2020). *Headspace, Calm, Ten Percent Happier and other meditation apps see surge in coronavirus-related relaxation*. The Washington Post. <https://www.washingtonpost.com/technology/2020/04/21/meditation-up-during-coronavirus/>
- Lopez, S. J., Floyd, R. K., Ulven, J. C., & Snyder, C. R. (2000). Hope therapy: Helping clients build a house of hope. In *Handbook of hope* (pp. 123–150). Elsevier.
- MacLeod, C., & Clarke, P. J. F. (2015). The Attentional Bias Modification Approach to Anxiety Intervention. *Clinical Psychological Science*, 3(1), 58–78. <https://doi.org/10.1177/2167702614560749>
- Masi, C. M., Chen, H.-Y., Hawkey, L. C., & Cacioppo, J. T. (2010). A Meta-Analysis of Interventions to Reduce Loneliness. *Personality and Social Psychology Review*, 15(3), 219–266. <https://doi.org/10.1177/1088868310377394>
- Moeller, J. (2015). A word on standardization in longitudinal studies: don't. *Frontiers in Psychology*, 6, 1389.
- Möhring, K. (2012). The fixed effects approach as an alternative to multilevel analysis for cross-national analyses. *Crafting Cross-National Social Policy Analysis*, 1–19.
- Muthén, B., & Muthén, L. (2017). *Mplus*. Chapman and Hall/CRC.
- Okulicz-Kozaryn, A., & Mazelis, J. M. (2017). More Unequal in Income, More Unequal in Wellbeing. *Social Indicators Research*, 132(3), 953–975. <https://doi.org/10.1007/s11205-016-1327-0>
- Patel, J. A., Nielsen, F. B. H., Badiani, A. A., Assi, S., Unadkat, V. A., Patel, B., Ravindrane, R., & Wardle, H. (2020). Poverty, inequality and COVID-19: the forgotten vulnerable. *Public Health*, 183, 110.
- Porges, S. W. (2007). The polyvagal perspective. *Biological Psychology*, 74(2), 116–143. <https://doi.org/10.1016/j.biopsycho.2006.06.009>
- Pressman, S. D., & Cross, M. P. (2018). Moving Beyond a One-Size-Fits-All View of Positive Affect in Health Research. *Current Directions in Psychological Science*, 096372141876021. <https://doi.org/10.1177/0963721418760214>
- Proulx, C. M., Helms, H. M., & Buehler, C. (2007). Marital quality and personal well-being: A meta-analysis. *Journal of Marriage and Family*, 69(3), 576–593. <https://doi.org/10.1111/j.1741-3737.2007.00393.x>
- Rutter, M. (1993). Resilience: Some conceptual considerations. In *Journal of Adolescent Health* (Vol. 14, Issue 8, pp. 626–631). Elsevier Science. [https://doi.org/10.1016/1054-139X\(93\)90196-V](https://doi.org/10.1016/1054-139X(93)90196-V)
- Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology*, 57(6), 1069–1081. <https://doi.org/10.1037/0022-3514.57.6.1069>
- Ryff, C. D., & Singer, B. H. (2008). Know thyself and become what you are: A eudaimonic approach to psychological well-being. *Journal of Happiness Studies*, 9(1), 13–39.
- Siddaway, A. P., Taylor, P. J., & Wood, A. M. (2018). Reconceptualizing Anxiety as a Continuum

- That Ranges From High Calmness to High Anxiety: The Joint Importance of Reducing Distress and Increasing Well-Being. In *Journal of Personality and Social Psychology* (Vol. 114, Issue 2, pp. e1–e11). American Psychological Association. <https://doi.org/10.1037/pspp0000128>
- Sin, N. L., & Lyubomirsky, S. (2009). Enhancing well-being and alleviating depressive symptoms with positive psychology interventions: a practice-friendly meta-analysis. *Journal of Clinical Psychology*, 65(5), 467–487. <https://doi.org/10.1002/jclp.20593>
- Snyder, C. R. (1999). *Coping: The psychology of what works*. Oxford University Press, USA.
- Snyder, C. R. (2004). *Hope and depression: A light in the darkness*. Guilford Press.
- Sun, R., Rieble, C., Liu, Y., & Sauter, D. (2020). *Connected Despite COVID-19: The Role of Social Interactions and Social Media for Wellbeing*.
- Sun, R., & Sauter, D. (2021). Sustained Stress Reduces the Age Advantages in Emotional Experience of Older Adults: Commentary on Carstensen et al. (2020). *Psychological Science*, 32(12), 2035–2041. <https://doi.org/10.1177/09567976211052476>
- Taylor, S. E. (2006). Tend and befriend: Biobehavioral bases of affiliation under stress. *Current Directions in Psychological Science*, 15(6), 273–277. <https://doi.org/10.1111/j.1467-8721.2006.00451.x>
- Torales, J., O’Higgins, M., Castaldelli-Maia, J. M., & Ventriglio, A. (2020). The outbreak of COVID-19 coronavirus and its impact on global mental health. *International Journal of Social Psychiatry*, 0020764020915212. <https://doi.org/10.1177/0020764020915212>
- Triandis, H. C. (1989). The self and social behavior in differing cultural contexts. *Psychological Review*, 96(3), 506–520. <https://doi.org/10.1037/0033-295X.96.3.506>
- Vinkers, C. H., van Amelsvoort, T., Bisson, J. I., Branchi, I., Cryan, J. F., Domschke, K., Manchia, M., Pinto, L., de Quervain, D., Schmidt, M. V., & van der Wee, N. (2020). Stress resilience during the coronavirus pandemic. *European Neuropsychopharmacology*, 35, 12–16. <https://doi.org/10.1016/j.euroneuro.2020.05.003>
- Wade, L. (2020). An unequal blow. *Science*, 368(6492), 700–703. <https://doi.org/10.1126/science.368.6492.700>
- Wadhwa, R. K., Wadhwa, P., Gaba, P., Figueroa, J. F., Joynt Maddox, K. E., Yeh, R. W., Shen, C., Maddox, K. E. J., Yeh, R. W., Shen, C., Joynt Maddox, K. E., Yeh, R. W., & Shen, C. (2020). Variation in COVID-19 Hospitalizations and Deaths across New York City Boroughs. *JAMA - Journal of the American Medical Association*, 323(21), 2192–2195. <https://doi.org/10.1001/jama.2020.7197>
- Wasserman, I. M. (1992). The Impact of Epidemic, War, Prohibition and Media on Suicide: United States, 1910–1920. *Suicide and Life-Threatening Behavior*, 22(2), 240–254. <https://doi.org/10.1111/j.1943-278X.1992.tb00231.x>
- Wilson, I. B., & Cleary, P. D. (1995). Linking clinical variables with health-related quality of life. A conceptual model of patient outcomes. *JAMA*, 273(1), 59–65. <https://doi.org/10.1001/jama.1995.03520250075037>
- Wirth, R. J., & Edwards, M. C. (2007). Item factor analysis: Current approaches and future directions. *Psychological Methods*, 12(1), 58–79. <https://doi.org/10.1037/1082-989X.12.1.58>
- World Health Organization. (2004). *Promoting mental health: Concepts, emerging evidence, practice: Summary report*. World Health Organization.
- Wu, Y.-J., Wu, Y.-J., Chen, C.-W., & Sun, R. (2021). *The Relations of Social Support and Social Connectedness to Well-being during the COVID-19 Pandemic across 49 countries*. PsyArXiv. <https://osf.io/7fqvs>
- Zhang, D. D., Lee, H. F., Wang, C., Li, B., Pei, Q., Zhang, J., & An, Y. (2011). The causality analysis of climate change and large-scale human crisis. *Proceedings of the National Academy of Sciences*, 108(42), 17296 LP – 17301. <https://doi.org/10.1073/pnas.1104268108>