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Making sense of a pandemic: Mindsets influence emotions, behaviors, health, and wellbeing during the COVID-19 pandemic

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ABSTRACT

Rationale: As the SARS-COV-2 virus spread across the world in the early months of 2020, people sought to make sense of the complex and rapidly evolving situation by adopting mindsets about what the pandemic was and what it meant for their lives.

Objective: We aimed to measure the mindsets of American adults over the first six months of the COVID-19 pandemic to understand their relative stability over time and their relationship with emotions, behaviors, experiences, and wellbeing.

Methods: American adults (N = 5,365) were recruited in early March of 2020 to participate in a longitudinal survey with follow-up surveys at 6-weeks and 6-months. Three mindsets that people formed about the COVID-19 pandemic were measured: 'the pandemic is a catastrophe', 'the pandemic is manageable' and 'the pandemic can be an opportunity'.

Results: In line with our pre-registered hypotheses, these mindsets were associated with a unique and largely self-fulfilling pattern of emotions (positive, negative), behaviors (healthy, unhealthy, and compliance with CDC guidelines), experiences (growth/connection, isolation/meaninglessness) and wellbeing (physical health, mental health, quality of life). Moreover, mindsets formed in the first week of the pandemic were associated with quality of life 6 months later, an effect that was mediated by emotions and health behaviors.

Conclusion: The mindsets that people adopted about the COVID-19 pandemic - that it is 'a catastrophe', 'manageable', or 'an opportunity' may explain some of the heterogeneity in the lived experiences of Americans through their self-fulfilling impact on peoples' emotions, health behaviors, and wellbeing.

On March 11th, 2020, in response to the outbreak of the novel coronavirus (COVID-19), the World Health Organization declared a global pandemic (World Health Organization, 2020). Beset by uncertainty, people sought to make sense of this strange and unpredictable new situation. Many wondered what the pandemic would mean for their own lives and for the future of the world. Is this pandemic a catastrophe or is it manageable? Could it even be an opportunity for societal change?

Even under normal circumstances, the world is complex and uncertain. To manage the complexity and uncertainty of an ever-changing environment, we adopt mindsets—simplified assumptions about the nature and workings of things in the world (Molden and Dweck, 2006). The assumptions we make are not necessarily true or false, right or

wrong. Rather, they organize and simplify complex information in ways that create meaning (e.g., why is this happening?), make predictions (e.g., what will happen next?), and motivate action (e.g., what should I do?).

As a result, the mindsets we adopt can have a meaningful impact on our lives because they influence what we feel, experience, and do (Crum et al., 2013; Dweck & Yeager, 2016). For instance, adopting the mindset that "stress is enhancing" (as opposed to "stress is debilitating") can increase positive affect, cognitive flexibility, and the release of growth promoting anabolic hormones in response to a stressor (Crum et al., 2017). Similarly, people with more positive mindsets about the nature of aging (e.g., "aging is typified by wisdom") engage in more preventative

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health behaviors, have fewer coronary events, and even have longer lifespans than those with less adaptive mindsets (e.g., “aging is an inevitable decline”) (Levy, 2009). In the context of the COVID-19 pandemic, the mindsets that people adopt about the nature of the pandemic may influence similar affective, behavioral, health, and wellbeing outcomes at the individual level, thereby shaping broader societal trends.

When news spread about the SARS-COV-2 virus there were, not surprisingly, no measures to assess peoples’ beliefs or mindsets within this domain, so we adapted ongoing research on illness mindsets to apply to this novel situation. Previous research on illness mindsets, which builds on a long history of research on illness representations (Leventhal et al., 1984) and illness perceptions (Pastor et al., 1993; Scharloo et al., 2000; Weinman et al., 1996), identified three mindsets that people can endorse when faced with a chronic illness: the mindset that their illness is ‘a catastrophe’, ‘manageable’, or ‘an opportunity’ (Zion, 2021; Zion et al., 2019). Through a series of factor analyses this work showed that these mindsets are relatively orthogonal from one another; in other words, people can endorse the catastrophe, opportunity, and manageable mindset to a greater or lesser degree, independently of each other. Moreover, this research indicated that the relative strength of the endorsement of each mindset is associated with physical, social and emotional functioning. In patients with diabetes, cardiovascular disease and osteoarthritis for example, greater endorsement of the catastrophe mindset is associated with greater deficits in physical, social, and emotional functioning whereas greater endorsement of the ‘illness manageable’ or ‘illness opportunity’ mindset is associated with better functioning. In patients with cancer, illness mindsets are associated with functioning outcomes above and beyond presence of disease (i.e., whether an individual is in the acute treatment phase vs. the survivorship period) and clinically diagnosed severity of disease (i.e., cancer stage) (Zion, 2021).

In line with this research, we hypothesized that endorsement of mindsets about the pandemic would also be associated with emotions and behaviors in meaningful ways. To test this hypothesis, we explored how these mindsets relate to how people felt (positive and negative affect), how they behaved (healthy behaviors, unhealthy behaviors, and compliance with CDC guidelines), the types of experiences they had (isolation/meaningless, growth/connection), and how well they reported themselves to be (physical health, mental health, and quality of life) across the first 6 months of the pandemic (see Fig. 1 and the measures section for additional information on the individual items and the timepoints of assessment).

We predicted that endorsement of the mindset that ‘the pandemic can be an opportunity’ would be associated with more adaptive outcomes. Specifically, we predicted that people who more strongly endorsed this mindset would feel more positive emotions, engage in more health promoting behaviors, seek out more experiences of growth/connection, and report fewer experiences of isolation/meaninglessness. Conversely, we predicted that endorsement of the mindset that ‘the pandemic is a catastrophe’ would be associated with maladaptive outcomes as the pandemic progressed. These individuals would feel less positive and more negative emotions, engage in fewer health promoting and more unhealthy behaviors, seek out fewer experiences of growth/connection, and report a greater number of experiences of isolation/meaninglessness.

Our hypotheses regarding the opportunity and catastrophe mindset were largely based on existing research on illness mindsets (Zion, 2021) and stress mindsets (Crum et al., 2013), however, we had relatively little previous literature to go on when making predictions about the manageable mindset in the context of the pandemic. On the one hand, the mindset that a chronic illness is manageable is generally associated with better mental and physical health (Zion, 2021). However, this mindset may have a different meaning—and therefore serve a different

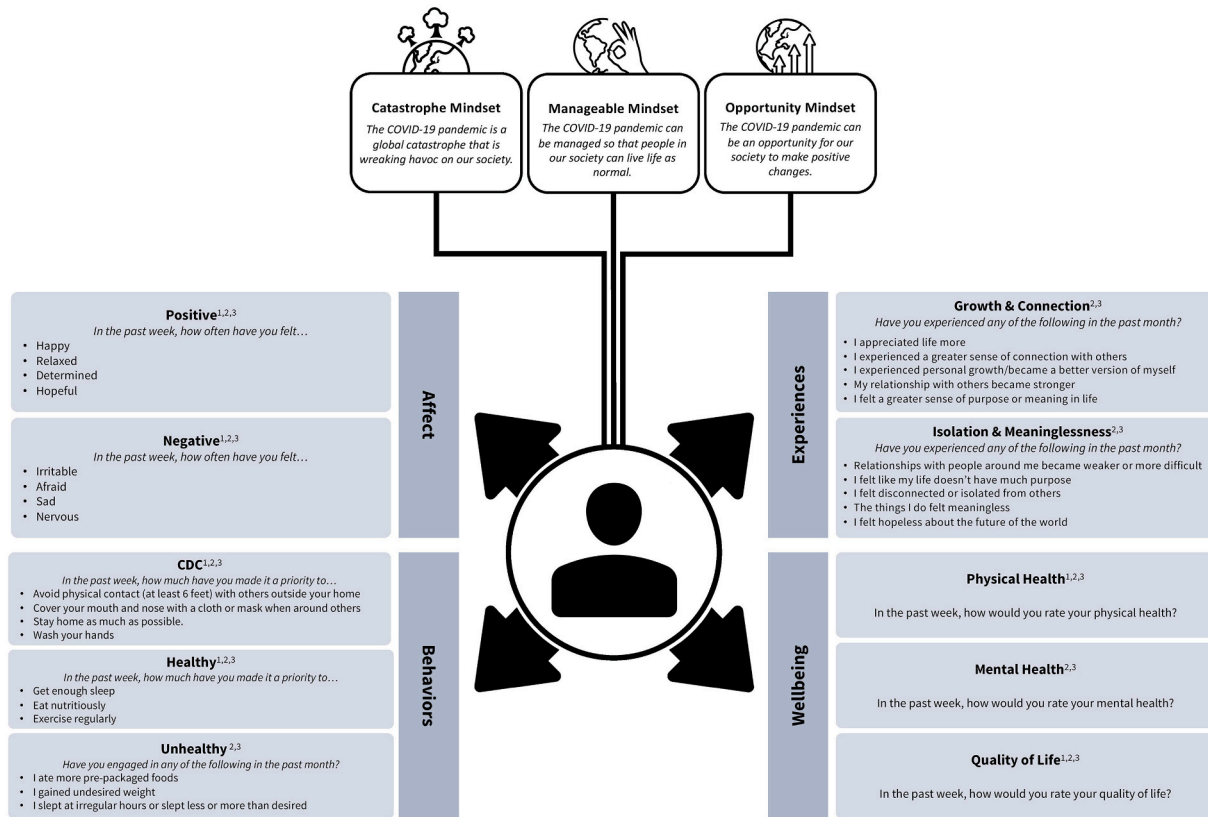


Fig. 1. Outcome measures included in analyses. Superscripts indicate timepoints of assessment. T1 survey was conducted March 11th – 21st, 2020; T2 survey was conducted April 26th – May 5th, 2020; T3 survey was conducted September 16th – 27th, 2020.

function—in the context of a global pandemic. In the context of the pandemic, the manageable mindset may have reflected an individual's assessment of the gravity of the threat the pandemic posed (e.g., that it was not as threatening or widespread) as opposed to an assessment of whether the repercussions of the pandemic were themselves manageable. Therefore, because of the uncertainty around the meaning of the manageable mindset in this context, we did not make predictions about whether the manageable mindset would be adaptive or maladaptive.

For all three mindsets, we predicted associations at the between-subjects level (e.g., on average, mindsets would relate to the four categories of outcomes described above) as well as at the within-subjects level (e.g., changes in an individual's endorsement of a particular mindset would relate to changes in outcomes overtime). We also hypothesized a specific pattern of how these responses would unfold overtime: mindsets formed early in the pandemic would be associated with peoples' emotions and health behaviors 6 weeks later, which would, in turn, be associated with wellbeing 6 months into the pandemic.

Detailed hypotheses (including the directionality of the effects), our broader theoretical model, a description of our measures, and our analytic approach were pre-registered on OSF (https://osf.io/4cus5/?view_only=85053bb4fd2f43e1b36d1d300021df10; see Aim 2 of COVID-19 T3 Follow-up Survey Registration.pdf).

1. Methods

1.1. Participants and procedure

American adults were recruited to participate in a survey about their perceptions of and reactions to the COVID-19 pandemic through a social media advertising campaign on Facebook and Twitter (See Fig. S1 in the Supplementary Materials). All U.S. residents over the age of 18 were eligible to participate in the study. Recruitment for the first survey (T1) took place over a ten-day period starting on March 11th, 2020, the day the World Health Organization (WHO) officially declared COVID-19 a global pandemic. Data were collected from 22,276 participants at T1, 16,327 of whom provided an email address as consent to be contacted for follow-up survey and met our pre-registered inclusion and data quality criteria.

Participants were invited over email to complete two follow-up surveys approximately 6-weeks (T2; May 2020) and 6-months (T3; October 2020) after the initial survey. In early March 2020, many people believed the pandemic would be a short-lived experience of 1–2 months (and many shelter in place recommendations were set to expire in 6 weeks). Therefore, we set an initial follow-up for approximately 6 weeks. When it became apparent the pandemic was not a short-term situation, we set another follow up survey for six months after the initial survey to explore how their mindsets may or may not have changed as the pandemic lingered.

In total, $N = 9,643$ participants completed the second survey and $N = 7,287$ participants completed the third survey. Participants who indicated contracting COVID-19 ($N = 72$) were removed prior to analyses. A total of $N = 5,365$ COVID-negative participants completed all three surveys and were included in the subsequent longitudinal analyses. Within this sample of $N = 5,365$ participants, items that were missing at random were imputed using multiple imputation methods (e.g., predictive mean matching) in R using the MICE package, which is a valid and unbiased methods for data that are missing at random (Bell et al., 2014). Responses were imputed for 84 participants who had one or more missing responses determined to be missing at random. Baseline differences in demographics, mindsets, and outcome variables across retention rate are included in Supplemental Tables S5–S7. Sensitivity analyses comparing imputed analysis with complete case analysis yielded similar findings and can be found in Supplemental Table S8.

1.2. Measures

1.2.1. Mindsets

Mindsets about the COVID-19 Pandemic were measured using an adapted version of the Illness Mindset Inventory (IMI), which measures three mindsets about the nature and meaning of illness: that it is a catastrophe, manageable, or an opportunity (Zion, 2021). Previous research validated a 10-item scale (3–4 items for each of the 3 mindsets) in the context of chronic disease using extensive validation analyses (Zion, 2021) and also showed that the single-item measures correlated highly with each of the 3–4 item scales and were equally predictive of important wellbeing outcomes. For ease of measurement, we adapted the scale to focus on mindsets about the “pandemic” as opposed to “chronic disease” and assessed each mindset with a single item rated on a 6-point Likert scale ranging from (1) strongly disagree to (6) strongly agree.

1.2.2. Emotions

Emotions were measured using an adapted version of the Positive and Negative Affect Scale (PANAS) that asked participants to indicate the extent to which they have felt four positive emotions (happy, relaxed, determined, hopeful) and four negative emotions (irritable, afraid, sad, nervous) over the last week (Crawford and Henry, 2004). Separate summary scores were calculated for positive affect ($\alpha = 0.75$ – 0.79 across timepoints) and negative affect ($\alpha = 0.73$ – 0.82 across timepoints) by averaging the respective items at each timepoint.

1.2.3. Health behaviors

Engagement of CDC recommended behaviors was measured by asking how much participants prioritized physical distancing, staying home, wearing a face mask, and hand washing. Summary scores were calculated by averaging the items at each timepoint ($\alpha = 0.53$ – 0.74 across timepoints).

Health promoting behaviors were measured by asking how much participants prioritized getting enough sleep, eating nutritiously, and exercising regularly. Summary scores were calculated by averaging the items at each timepoint ($\alpha = 0.68$ – 0.71 across timepoints).

Unhealthy behaviors were measured using a binary (i.e., yes or no) checklist of items related to eating more pre-packaged food, gaining undesired weight, and sleeping irregularly. A total score for unhealthy behaviors was calculated at each timepoint by taking the sum of the three items.

1.2.4. Experiences of growth/connection and isolation/meaninglessness

We measured two categories of experiences: experiences characterized by isolation or meaninglessness (e.g., the things I do felt meaningless; I felt hopeless about the future of the world), and experiences characterized by personal growth or connection (e.g., I appreciated life more; I felt a greater sense of purpose or meaning in life). Each category consisted of five items assessed over the previous month using a binary (i.e., yes or no) checklist. Total scores for both categories of experiences were calculated by taking the sum of the respective items at each timepoint.

1.2.5. Wellbeing

Quality of life, physical health, and mental health were each measured using a single item from the PROMIS Global Health Scale version 1.2. (Cella et al., 2010). See Fig. 1 for specific items included in each measure.

2. Results

2.1. Sample demographics

Our final sample included $N = 5,365$ participants who completed all three surveys. Participants came from all fifty states and ranged in age

from 18 to 89 years (mean = 45.58, SD = 14.34). The sample was 81% female, 89% white, and 80% indicated educational attainment of at least a high school degree. See Methods for complete details on participants and recruitment.

2.2. How strongly do people endorse catastrophe, manageable, and opportunity mindsets?

Mean agreement with the opportunity, manageable and catastrophe mindsets at baseline (T1), 6-weeks into the pandemic (T2) and 6 months into the pandemic (T3) are illustrated in Fig. 2a. In the first week of the pandemic, endorsement of both the catastrophe and the opportunity mindsets were high (65.75% of people endorsed a catastrophe mindset and 75.57% of people endorsed the opportunity mindset, as indicated by responding ‘agree’ or ‘strongly agree’). In contrast, endorsement of the manageable mindset was low (only 13.77% responded ‘agree’ or ‘strongly agree’). As the pandemic progressed, endorsement of the manageable mindset increased whereas endorsement of the catastrophe

and opportunity mindsets remained relatively consistent, with only slight variations occurring between timepoints. Fig. 2 details the changes in mindsets as well as the longitudinal changes in emotions (Fig. 2b), experiences of isolation/meaninglessness and growth/connection (Fig. 2c), health behaviors (Fig. 2d), and wellbeing (Fig. 2e) across the three time periods collected in this study. On average and in line with other research (Zacher and Rudolph, 2021), wellbeing declined during the first 6 months of the pandemic.

Correlational analyses at T1 revealed that peoples’ endorsement of the manageable mindset and catastrophe mindset were negatively correlated ($r = -0.25$; $p < 0.001$). The opportunity mindset was not significantly correlated with the manageable mindset ($r = -0.03$; $p = 0.054$) but was positively correlated with the catastrophe mindset ($r = 0.11$; $p < 0.001$). Correlations remained relatively stable over time (see Supplemental Table S1). None of the correlations were large, which is in line with previous research suggesting these mindsets are independent and not overlapping constructs (Zion, 2021).

Cross sectional correlations between mindsets, emotions,

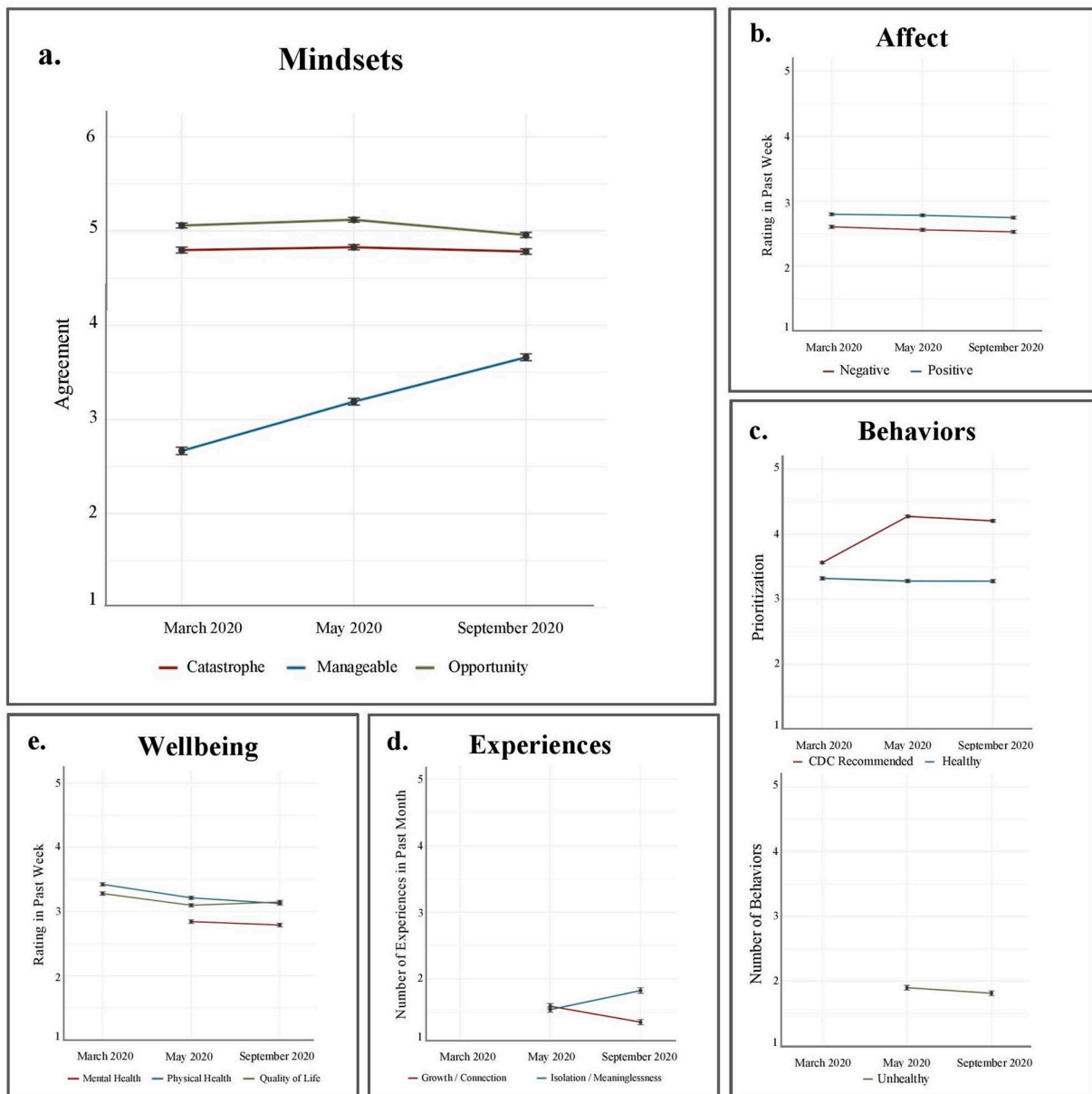


Fig. 2. Changes in (a) mindsets, (b) affect, (c) behaviors, (d) experiences, and (e) wellbeing over the first six months of the COVID-19 Pandemic. Error bars represent 95% CI.

experiences of growth/connection or isolation/meaninglessness, health behaviors, and wellbeing are included in the supplemental materials (Tables S2–S4).

2.3. Associations between mindsets and emotions, experiences, health behaviors, & wellbeing

To test our pre-registered hypotheses that mindsets are associated with self-fulfilling changes in emotions, experiences, health behaviors, and wellbeing, we ran a series of mixed effects models to examine between- and within-subject effects of each mindset on the outcomes listed above. Between-subjects analyses explore how differences in mindsets between people relate to differences in outcomes on average, collapsed over time. Within-subjects analyses provide greater depth to these findings by indicating how change in an individual’s mindset corresponds with change in outcomes at any given time (Curran and Bauer, 2011). All models controlled for age, race, gender, education, and political affiliation. These demographic variables were selected due to their potential relationship with mindsets and health-relevant outcomes, as has been reported elsewhere in the literature (Cutler and Lleras-Muney, 2010; Deeks et al., 2009; Grossman et al., 2020; Mezuk et al., 2010). Additional information on the covariate selection can be found in the supplemental materials. Due to skewness in the distribution of agreement with the mindset items, these three items were log transformed prior to analysis. Complete results for both between- and within-subjects effects of mindsets on outcomes are reported in Table 1.

As hypothesized, both between- and within-subjects analyses suggested that the ‘pandemic is a catastrophe’ mindset was generally associated with a maladaptive pattern of emotions, experiences of growth/connection, experiences of isolation/meaninglessness, health behaviors, and wellbeing. More specifically, between-subjects analyses revealed that greater agreement with the catastrophe mindset related to less positive affect, greater negative affect, more frequent unhealthy behaviors, more experiences of isolation/meaninglessness, worse physical/mental health, and lower quality of life. Within-subjects analyses mirrored these patterns, suggesting that an increase in agreement with the catastrophe mindset was associated with a corresponding decrease in positive affect, physical health, and quality of life, and an increase in negative affect, and unhealthy behaviors. Counter to our predictions, we did not observe a significant negative association between the catastrophe mindset and experiences of growth/connection, nor were changes in the catastrophe mindset associated with corresponding changes in experiences of isolation/meaninglessness or mental health.

Also as predicted, the mindset that ‘the pandemic is an opportunity’ was associated with an adaptive pattern of emotions, experiences of growth/connection, experiences of isolation/meaninglessness, health behaviors, and wellbeing. Between-subjects analyses indicated that greater agreement with the opportunity mindset was associated with greater positive affect, fewer experiences of isolation/meaninglessness, more experiences of growth/connection, better mental health, and better quality of life. Within-subjects analyses mirrored these results in all cases, although the associations were weaker in magnitude. Counter to our predictions, the opportunity mindset was not significantly associated with a reduction in unhealthy behaviors, and the effect on physical health was negligible (and not significant at the $p < 0.01$ level). As predicted, the opportunity mindset was not associated with negative affect.

Exploratory analyses of the mindset that ‘the pandemic is manageable’ suggested that, between subjects, higher endorsement of this mindset was associated with greater positive affect, less negative affect, fewer experiences of isolation/meaninglessness, more healthy behaviors, fewer unhealthy behaviors, and better wellbeing (physical health, mental health, and quality of life). Only the association with affect was significant ($p < 0.001$) at the within-subjects level.

Exploratory analyses of the association between mindsets and compliance with CDC guidelines suggested that both the catastrophe

Table 1
Results of mixed effects models. Standardized betas and 95% CI are reported for between-subjects effects and within-subjects effects for each of the three mindsets. Mindsets were log transformed prior to analyses. All mixed effects models controlled for age, race, gender, education attainment, and political affiliation. Asterisks indicate level of significance such that * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$. Significant findings at the $p \leq 0.01$ level are bolded.

	Catastrophe Mindset			Manageable Mindset			Opportunity Mindset					
	Between Effects		Within Effects	Between Effects		Within Effects	Between Effects		Within Effects			
	Std. β	95% CI	Std. β	95% CI	Std. β	95% CI	Std. β	95% CI	Std. β	95% CI		
Emotions												
Positive	-0.15***	-0.17–0.13	-0.05***	-0.06–0.04	0.15***	0.13–0.17	0.03***	0.02–0.04	0.16***	0.14–0.18	0.04***	0.03–0.05
Negative	0.23***	0.21–0.25	0.07***	0.06–0.08	-0.14***	-0.17–0.12	-0.03***	-0.04–0.02	-0.01	-0.04–0.01	-0.01	-0.02–0.00
Experiences												
Growth/Connection	-0.01	-0.03–0.02	-0.02	-0.04–0.01	-0.03	-0.06–0.00	-0.03*	-0.06–0.00	0.27***	0.24–0.29	0.07***	0.04–0.09
Isolation/Meaninglessness	0.15***	0.13–0.18	0.02	-0.00–0.05	-0.08***	-0.12–0.06	0.02	-0.00–0.05	-0.09***	-0.12–0.06	-0.04**	-0.07–0.02
Behaviors												
Unhealthy Behaviors	0.12***	0.10–0.15	0.05***	0.02–0.07	-0.07***	-0.09–0.04	0.03	0.00–0.05	-0.02	-0.05–0.00	0.00	-0.02–0.03
Healthy Behaviors	-0.02	-0.04–0.00	-0.01	-0.02–0.00	0.04**	0.02–0.06	0.01	-0.00–0.02	0.11***	0.09–0.13	0.02***	0.01–0.03
CDC Behaviors	0.21***	0.10–0.23	0.05***	0.04–0.06	-0.23***	-0.25–0.21	-0.05***	-0.06–0.04	0.19***	0.17–0.21	0.04***	0.03–0.05
Health & Wellbeing												
Physical Health	-0.08***	-0.10–0.06	-0.02***	-0.03–0.01	0.13***	0.10–0.15	0.01	-0.00–0.02	0.03*	0.01–0.05	0.01	0.00–0.03
Mental Health	-0.14***	-0.17–0.12	-0.01	-0.04–0.01	0.10***	0.08–0.13	-0.02	-0.04–0.01	0.07***	0.04–0.10	0.04**	0.01–0.06
Quality of Life	-0.14***	-0.16–0.12	-0.05***	-0.06–0.04	0.11***	0.09–0.14	0.01	-0.01–0.02	0.12***	0.10–0.14	0.03***	0.02–0.04

and the opportunity mindset were significantly associated with greater compliance with CDC recommended behaviors. Conversely, we observed significant negative between- and within-subjects effects of the manageable mindset on compliance with CDC recommended behaviors.

2.4. How do mindsets at the start of the pandemic impact quality of life 6 months later?

To test our theoretical model that mindsets lead to differences in affect and behavior, which, in turn, influence more global assessments of wellbeing, we explored three separate multiple mediation models for each measure of wellbeing (quality of life, physical health, and mental health). Each model included the mindset measured at T1 as the independent variable and wellbeing measured at T3 as the outcome variable. Four mediators, each measured at T2, were included: negative affect, positive affect, healthy behaviors, and unhealthy behaviors. Engagement in CDC recommended behaviors were not included in mediation models as we did not have a clear theoretical rationale for how they would mediate the effects of the mindsets on quality of life in cases where COVID-19 was not contracted (on the one hand, engaging in CDC behaviors such as handwashing, social-distancing and mask-wearing could improve quality of life by helping prevent illness; on the other hand, engaging in these behaviors could reduce quality of life by increasing discomfort, anxiety and isolation). Experiences of growth/connection and isolation/meaninglessness were also not included in mediation models as they were not a part of our pre-registered theoretical model. All mediation models controlled for age, race, gender, education, and political affiliation. Due to skewness in the distribution of agreement with the mindset items, these three items were log transformed prior to analysis.

Results of these mediation models for quality of life are reported in Fig. 3. The association between the catastrophe mindset in March 2020 and quality of life six months later was mediated by increased negative affect, decreased positive affect, and engagement in unhealthy behaviors reported in early May (Fig. 3a). The pandemic opportunity mindset was associated with quality of life six months later through via changes in positive affect and prioritization of health promoting behaviors (Fig. 3b). Finally, the pandemic manageable mindset was associated with quality of life through affective – but not behavioral – mediators (Fig. 3c). Similar effects were noted for mental and physical health measures of wellbeing and are reported in the supplement (See Fig. S2).

3. Discussion

While the number of COVID-19 infections ebbed and flowed over the course of 2020, for many, the distress of the pandemic itself only compounded with time. However, there was a great deal of heterogeneity in the lived experiences of people during this time. This longitudinal study of 5,365 Americans provides insight into how three mindsets about the pandemic – that it is ‘a catastrophe’, ‘manageable’, or ‘an opportunity’ – explain some of this heterogeneity through their self-fulfilling impact on peoples’ emotions, health behaviors, and wellbeing.

We assessed mindsets about the COVID-19 pandemic at three time-points: March, May, and September of 2020. At the start of the pandemic, the catastrophe and opportunity mindsets were both widely adopted, however they oriented people to two very different realities. Those who held the mindset that the pandemic was a catastrophe were more likely to experience higher levels of negative affect, lower levels of positive affect, greater engagement in unhealthy behaviors, more frequent experiences of isolation/meaninglessness, and report worse wellbeing. Conversely, agreement with the opportunity mindset related to greater positive affect, more experiences of growth/connection, fewer experiences of isolation/meaninglessness, and better wellbeing. Relatively few people initially adopted the mindset that the COVID-19 pandemic was manageable; however, agreement with this mindset increased steadily over time. The manageable mindset related to several

individually adaptive outcomes, including engagement in fewer unhealthy behaviors, greater positive affect, less negative affect, and greater wellbeing; however, it was also strongly associated with lower prioritization of CDC recommended behaviors.

The between- and within-subjects effects of mindsets on affect, health behavior, experiences of isolation/meaningless or of growth/connection and wellbeing suggest that mindsets about the pandemic related to a self-fulfilling pattern of outcomes. The longitudinal multiple mediation analyses add to this finding by demonstrating a potential mechanism through which some of these effects operate. We found that mindsets at the start of the pandemic were associated with quality of life (and physical and mental health as indicated in supplement) 6 months later via affective and behavioral processes. This supports our theoretical model that mindsets are associated with wellbeing outcomes through these affective and behavioral pathways but do so in slightly different ways. These mechanistic nuances support the notion that mindsets are neither universally good or bad, but rather relate to different patterns of behaviors, emotions, and wellbeing over time. These patterns are also in line with those described in existing research on stress mindsets (Crum et al., 2017).

The mindsets people adopted in response to the COVID-19 pandemic were just that: subjective interpretations and not necessarily a fully objective or accurate reflection of reality. The data collected during the first week of the pandemic make this clear. People were likely reporting their mindsets about the pandemic before they fully understood the threat posed by the virus or experienced the true impact of the pandemic on their daily lives. In other words, people were not necessarily reporting that the pandemic was a catastrophe, manageable, or an opportunity because that reflected their current experience with the pandemic. But the way we organize and simplify complex information can critically shape our lives by operating in self-fulfilling ways. This was demonstrated by the fact that these early mindsets were associated with important outcomes 6 months later.

In other words, mindsets may not be a reflection of current reality, but they do shape an individual’s *experience* of that reality as it unfolds, often in self-fulfilling ways. A novel virus was rapidly spreading around the globe and people had to make sense of the evolving situation and plan a course of action. The data from this study clearly indicate that mindsets were highly associated with the COVID-19 relevant behaviors people engaged in. Those who endorsed the catastrophe mindset more than others took the situation more seriously; they stayed home, washed their hands, and (when it was recommended) started wearing a mask. Interestingly, this appeared to be at the expense of other aspects of their wellbeing. This contrasts with the effects of the manageable mindset. Despite maintaining high levels of wellbeing during the pandemic, people who adopted the manageable mindset to a greater extent than others were much less likely to prioritize these CDC recommendations. As such, endorsement of this mindset may reflect an attempt to deny the reality of the global pandemic and a refusal to engage with it in a socially responsible way. Over time, as people adjusted to the changes necessitated by the pandemic, it may have become more adaptive.

The opportunity mindset seemed to provide the best of both world-views; those who adopted this mindset to a greater degree compared to others staved off major declines in wellbeing without subverting the behaviors necessary to engage with the pandemic in a socially responsible way. Interestingly, however, this mindset did not appear to boost self-reported physical health or reduce negative affect. The latter effect is consistent with research on stress mindsets, which suggests a stress-can-be-enhancing mindset—similar to the mindset that the pandemic can be an opportunity – relates to increased positive affect but does not necessarily drive people to avoid negative experiences (Crum et al., 2017).

Contrary to previous research on the role of these mindsets in chronic illness (Zion, 2021), in this study we observed a positive correlation between the catastrophe and opportunity mindsets in this context, suggesting that these assumptions are not mutually exclusive. What do

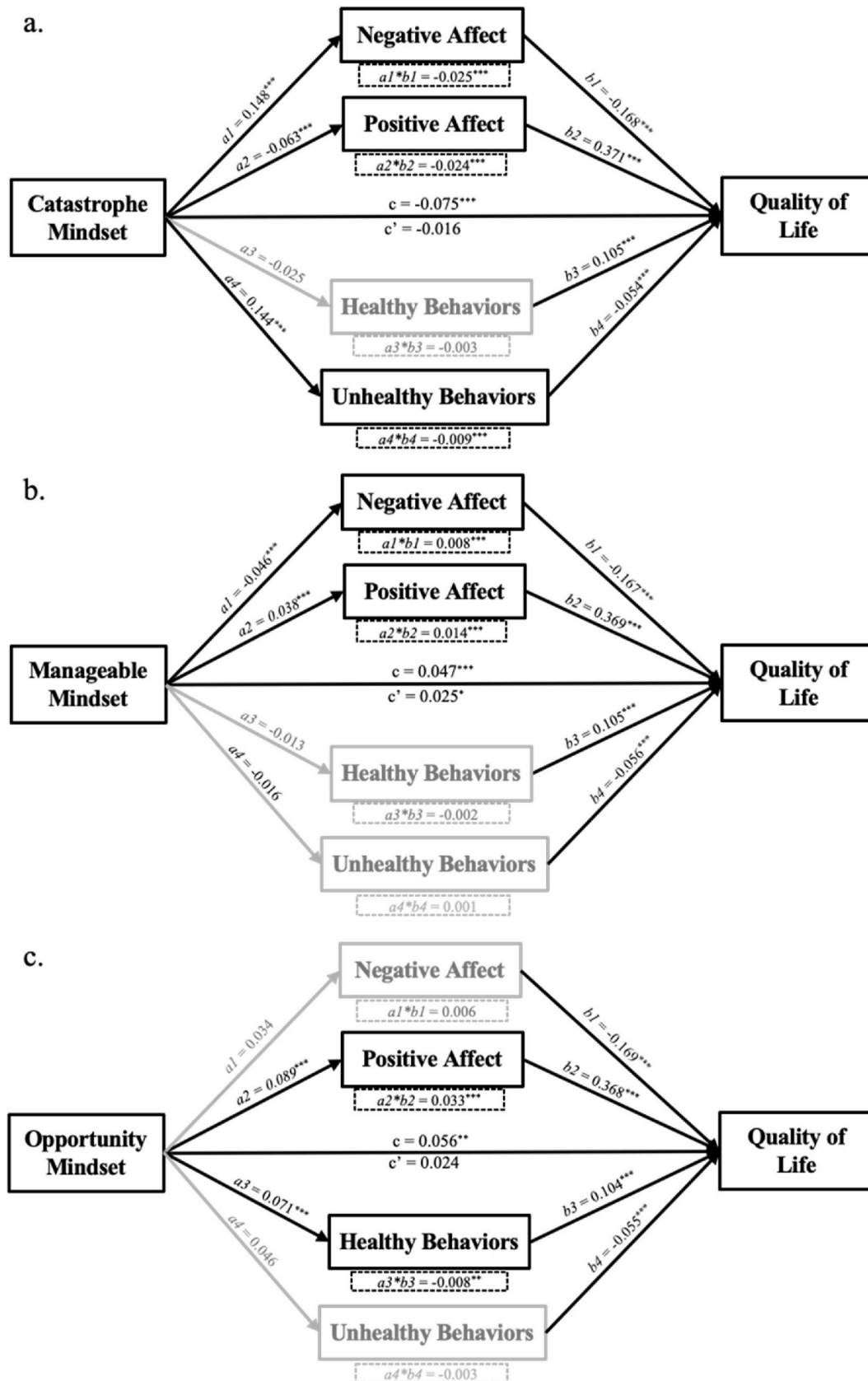


Fig. 3. Mediation models outlining the mechanisms through which the (a) catastrophe mindset, (b) manageable mindset, and (c) opportunity mindset influence quality of life. Mindsets were measured at T1, affective and behavioral mediators were measured at T2, and quality of life was measured at T3. Standardized estimates of direct and indirect effects are listed. Non-significant effects are indicated by faded text and gray arrows. Asterisks indicate level of significance such that * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

we make of this? Perhaps some acknowledgement of a situation as a catastrophe is necessary to recognize it as an opportunity. Perhaps a more useful mindset to explore in future research is something to the accord of ‘catastrophes can present opportunities for positive change’. Broadly, it suggests that seeing this pandemic as an opportunity does not necessarily require an individual to overlook or deny the negative aspects of this unique and challenging situation. People were able to recognize the pandemic’s toll on society while also seeing that the pandemic inspired many to slow down, reconnect with family, and reassess priorities in life. This is one of the benefits of mindsets: they help us simplify and organize information about a complex concept while allowing room for more nuance than a good vs. bad or right vs. wrong judgement. Future research on the interaction and relationship between mindsets (e.g., catastrophe and opportunity mindsets) is encouraged.

There are several other outstanding questions that this research was not able to address, but present interesting directions for future research. First, understanding where these specific mindsets emerge from and how they develop may be of interest. Work from related domains suggests other mindsets (e.g., about intelligence) come from a variety of sources, like our early childhood experiences, influential others, and the broader cultures in which we live. These external forces, in addition to internal forces like individual differences, may predispose an individual towards one mindset over another. Second, it is not yet known if these specific mindsets can be changed, however there is a rich history of research on the efficacy of relatively brief but highly targeted wise intervention (e.g., see Walton & Wilson, 2018). Targeting mindsets about the pandemic (or even about a post-pandemic future) with wise interventions may be one way to understand causal relationships between these mindsets and outcomes of interest. Finally, understanding the long-term implications of these mindsets may be valuable for addressing some of the more recent challenges associated with the COVID-19 pandemic, like vaccine hesitancy.

3.1. Limitations

There are several limitations of this study that should be considered when interpreting the results. First, this sample is not representative of the United States as a whole. Therefore, we do not intend to make claims about mindsets at a population level, but rather to explore the associations between mindsets and important outcomes within this sample. Relatedly, our sample is disproportionately female, white, and educated. This is likely due to our social media-based recruitment strategy. Advertisements on social media platforms are selectively displayed to individuals deemed likely to engage with the content. While this allowed us to quickly survey a large sample of participants, it came at the cost of a truly representative sample in terms of gender, race, and socioeconomic status. Additional research is needed to explore whether these patterns hold in more diverse/representative samples.

Second, we lost many participants to retention over the course of this 6-month long study. This attrition was expected and planned for due to our recruitment strategy (volunteer, with modest lottery-based incentives), the method of follow-up (e.g., via email), and the unique individual experiences of participants during the pandemic that took priority over completing our follow-up survey. Analyses of baseline variables across retention rate suggest that differences in demographic variables, individual differences, mindsets, and outcomes, were significant at the $p < 0.05$ level, but not large in magnitude. We have included additional details on these differences in the supplemental materials.

Third, many of the measures in this study were adapted and or shortened from previously validated scales to fit the context of the pandemic. Although these adaptations were necessary to respond quickly to a novel and uncertain context and designed to boost and maintain engagement in a short volunteer-based survey, the results should be taken with this context in mind and future research should continue to validate these measures both within the context of the COVID-19 pandemic and other health relevant contexts.

Fourth, we acknowledge that mindsets are just one piece of the puzzle. We do not wish to discount the many structural or situational variables (e.g., access and affordability of healthcare) that can impact health and wellbeing during a pandemic. We also do not wish to suggest that mindsets are a substitute for proper mental health care for those who need it during this challenging time.

Finally, we aim to describe these mindsets, not prescribe them. While some mindsets may be more useful than others for specific goals, there isn’t necessarily a right or wrong mindset for people to adopt as they navigate this pandemic. For example, the mindset that the pandemic is a catastrophe may certainly be maladaptive in many ways, but it appears to be associated with higher levels of engagement with CDC recommended behaviors. That said, this study hints at mindsets that could be more adaptive than others and future research may explore intervention strategies that help people adopt mindsets that best serve their individual goals.

4. Conclusion

Just as SARS-CoV-2 mutates and evolves over time, the lived experience of people around the world continues to change in response to the global pandemic. Although much remains to be explored - and cumulative effects of a distressing global event have yet to be fully understood - this work provides insight into how people’s mindsets shaped their wellbeing during the COVID-19 pandemic. It may also help to inform best practices for public messaging or targeted interventions for future societal disruptions. How will our mindsets affect the meaning we assign to the time spent in relative isolation from friends, family, and the normal rhythms of life? And perhaps more importantly, if our mindsets shaped our lived experiences during the pandemic, how might they relate to our wellbeing in a post-pandemic world?

Credit author statement

All authors - Sean R. Zion, Kengthsagn Louis, Rina Horii, Kari Leibowitz, Lauren C. Heathcote, and Alia J. Crum were involved in the investigation, methodology, and manuscript writing (original draft and review/editing). The first author, Sean R. Zion, and senior author, Alia J. Crum were involved in the conceptualization and funding acquisition. The first author, Sean R. Zion was involved in the project administration, validation, formal analysis, and visualization.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.socscimed.2022.114889>.

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