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COVID Time: How Quarantine Affects Feelings of Elapsed Time

Minju Han, Guy Voichkek, and Gal Zauberman

ABSTRACT

The lockdowns imposed in response to the COVID-19 pandemic abruptly upended people's lives and daily structure. In this survey of 1,506 Americans conducted in June 2020, we test how quarantine affects *feelings of elapsed time* (the subjective temporal distance from an event). We find that feelings of elapsed time are determined either by *how* people spent their time in quarantine or by *how much* time since an event was spent in quarantine, depending on whether people are still in quarantine at the time of evaluation. Specifically, whether people quarantined alone and the extent to which they maintained a temporal structure affect feelings of elapsed time while people are in quarantine; once people leave quarantine, feelings of elapsed time depend on *how much* of the time following an event was spent in quarantine, rather than on *how* they spent their time in it.

Keywords: time perception, temporal structure, quarantine, COVID-19

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INTRODUCTION

There's nothing different between Thursday and Sunday or Monday. The sameness feels numbing. I think it has screwed with my sense of time completely.

-Jenny Rappaport, *Scientific American*

On March 13, 2020, the U.S. Federal government declared the COVID-19 pandemic a national emergency. By April, mandatory lockdowns went into effect in many parts of the country, upending lives and having significant psychological consequences (Brooks et al. 2020; Kornilaki 2021; Meier, Cook, and Faasse 2021; Xin et al. 2020). Lockdowns abruptly changed the structure of days and weeks, as people's normal schedules changed at a scale rarely observed. We report findings from a study testing how lockdowns affected people's perceptions of time. In particular, we focus on how lockdowns affected *feelings of elapsed time*, the subjective temporal distance from past events.

Feelings of Elapsed Time since an event (FET for short) are affected by factors associated with the event, such as its complexity, emotionality, and memorability (Block and Zakay 1997; Bratfisch et al. 1971; Brown, Rips, and Shevell 1985; Friedman 1993; Twenge, Catanese, and Baumeister 2003). FET are also affected by the number of contextual changes that occur following an event (Bailey and Areni 2006). For example, the greater the number of event-related memory markers that occurred since an event, the more distant it feels (Zauberman et al. 2010).

Here, we investigate how factors both related and unrelated to an event, including ones that have been examined in prior research and ones that were not, affect FET in a study

conducted during the 2020 COVID-19 lockdowns. This unique context provides a natural setting that introduced changes in normal schedules such that different aspects of events and schedules could be measured. Psychologically relevant dynamics of this type cannot be implemented in the lab and can enrich our understanding of time perception. Importantly, people entered and left quarantine at different times that were determined externally and outside of their control. Thus, the proportion of time spent in quarantine since an event and whether one has left quarantine when making temporal assessments were determined externally. In addition, people varied on how well they maintained their normal temporal structure during quarantine (referred to as *sameness*; Wittmann and Lehnhoff 2005) and whether they were alone. This allowed us to test how these aspects of quarantine affected FET, both while people were still in and out of quarantine. We also used this setting to examine how FET are affected by features of the events themselves that were found to affect time perception in other contexts, including emotionality and memorability (Bratfisch et al. 1971; Brown et al. 1985).

Investigating how the quarantine period affected FET at this scale (rather than over short durations and small-scale disruptions) could have implications for decision-making processes and evaluations. While we are not aware of work that has directly examined the behavioral consequences of FET, research has documented important relationships between subjective distance from events and evaluations of those events. For instance, the same achievement is evaluated less favorably if perceived as more distant (Peetz and Wilson 2008; Wilson and Ross 2001). Relatedly, work on construal level theory suggests that psychological temporal distance can change how people appraise past events (Liberian, Trope, and Stephan 2007). Decisions and perceptions are also affected by other types of temporal judgments (Wittmann and Paulus 2008). For example, how long or short people anticipate future time periods to feel affects

temporal discounting (Kim and Zauberman 2009), and how distant a future period is perceived to be affects goal-pursuit (Perunovic and Wilson 2009). Thus, the current research provides a rare opportunity to examine how FET, a psychologically meaningful judgment and a potentially consequential input to behavior, depends on factors that are difficult to manipulate experimentally.

Next, we briefly discuss the key measures we collected. Note that we only focus on a subset of the items included in the survey; the full dataset is available online at <https://tinyurl.com/2p9xh45c> and researchers are encouraged to use it to test their own questions.

Share

One key aspect of the time period following an event is how much of it was spent in quarantine. For each event, for each participant, we define *share* as the share of the time interval following the event that was spent in quarantine. In other words, *share* is calculated by dividing the time since an event spent in quarantine by the total time since the event. We used *share* to test whether spending a greater part of the time following an event in quarantine makes the event feel closer or more distant.

Isolation

Many people quarantined alone. Whereas research such as Michel Siffre's classic studies of people isolated in a cave (Foer 2008) suggests that complete isolation can significantly affect time perception, no research has directly examined how FET are affected by isolation. This could be important, as FET were shown to depend on an emotional correlate of isolation: depression. Depression tends to expand FET (Pancani et al. 2021; Riva et al. 2014; Twenge et al. 2003).

Moreover, negative emotions such as social dissatisfaction, stress, and boredom all make elapsed time periods feel longer (Cellini et al. 2020; Vogel et al. 2018). Taken together, and considering that quarantining in isolation adversely affected mental health (Pancani et al. 2021), these findings suggest that people who quarantined alone may experience expanded FET relative to those who quarantined with others.

Sameness (lack of temporal structure)

Sameness refers to the extent to which quarantine broke down the distinction between days. Quarantine stripped away the rigid temporal structure characterizing the pre-pandemic days of many workers, for instance, by weakening the distinction between weekdays and weekends (Grondin, Mendoza-Duran, and Rioux 2020). As Rocheleau (2020) puts it: “quarantine...has made us reconsider how we explore time passing by—as seconds, minutes, days and weeks melt into each other”. In other contexts, temporal sameness during the time interval since an event has been shown to make an event feel more recent (Avni-Babad and Ritov 2003; Wittmann and Lehnhoff 2005). This occurs because FET often expands with the number of salient intervening events (Block and Reed 1978; Zauberman et al. 2010). Relatedly, when experiences feel more similar, they are mentally grouped under fewer, broader categories, making the time period encapsulating them feel like it passed faster (Landau et al. 2018). Hence, the sameness of quarantine days may decrease the perceived number of contextual changes since events and thereby decrease FET.

Whether Events Occurred Before or During Quarantine, and Whether the Survey was Completed While Respondents were Still in Quarantine or After Leaving it

Events that are distinct from everyday events (referred to as temporal landmarks in prior research; Radvansky and Copeland 2006; Kurby and Zacks 2008) often lead to segmentation, which occurs when people spontaneously organize time as pre- and post-event segments (Radvansky and Copeland 2006; Shum 1998). This can affect psychological distance and time perception (Block 1985; Poynter 1989; Zakay et al. 1994). For example, people tend to highlight intervening landmarks when motivated to make a certain time period feel distant, and ignore intervening landmarks when motivated to make a time period feel proximal (Peetz and Wilson 2014).

It is possible that the beginning and end of the quarantine period act as temporal landmarks, such that people segment time as before, during, and after quarantine. Therefore, we suspect that quarantine may affect FET differently depending on whether people are in or out of quarantine at the time of assessment, and whether events happened before or during quarantine. People who left quarantine may conceptualize the quarantine period differently from those who are still in quarantine, such that events that occurred before quarantine belong to a different psychological period than events that occurred during quarantine.

THE STUDY

To test how different features of the time period since an event spent in quarantine affect *Feelings of Elapsed Time* (FET), we asked participants living in the U.S. - both those still in quarantine and out of it - how temporally distant various public events and holidays feel, as well as about their experiences during quarantine, including how similar the days felt to one another

and whether they quarantined alone. We also asked participants how memorable and emotional events were, as these event-related factors were shown to affect FET in other contexts (Bratfisch et al. 1971; Brown et al. 1985). Responses were collected on June 13, 2020, three months after the first stay-at-home order in the U.S. went into effect. The study was preregistered (<https://aspredicted.org/9ex6x.pdf>).

Method

We opened the study for 1,500 U.S. participants on Prolific (www.prolific.co), and 1,506 participants completed the survey. Because we were interested in how quarantine affected FET, we excluded participants who said that they never went into quarantine (21% of participants) and excluded from analysis observations where both event and participant were post-quarantine (4% of observations in the effective sample). We also excluded participants who reported entering or leaving quarantine on non-existent calendar dates (<1% of remaining participants), who reported having searched online for information about the events (9% of remaining participants), or reported leaving quarantine on or before the day they entered it (<1% of remaining participants). This left us with an effective sample of 1,041 participants ($M_{\text{age}} = 32$; 52% female).

Event-related Questions. At the beginning of the survey, we asked participants whether they remembered each of 13 public events that happened before June 13, 2020 (Table 1). Participants then estimated how many weeks and days had passed since each event they indicated remembering (*estimated distance*). Then, to indicate their FET, participants reported how long ago each event *felt* like it occurred on a scale from 1 (“feels very recent”) to 15 (“feels very distant”). Next, participants indicated how memorable and emotionally provoking each event

was on a scale from 1 (“not at all”) to 9 (“very much so”) (Burt and Kemp 1991; Zauberman et al. 2010).

Quarantine-related Questions. Next, we asked participants about their quarantine period. We first asked participants whether they were ever in quarantine, defined as “the time in which your movement was restricted, and you minimized your time outdoors and in shared places due to the COVID-19 pandemic.” Those who reported to have been in quarantine were asked whether they were still in quarantine, whether they were in quarantine alone, and the dates their quarantine began and (for participants no longer in quarantine) ended. We also asked participants how memorable, emotional, and temporally distant the day they entered quarantine felt.

Next, participants completed a temporal sameness scale, composed of six items measuring how distinct days felt during quarantine relative to before quarantine (e.g., “Compared to the pre-quarantine days, while in quarantine, how easy is it to distinguish one day from another?”; see Appendix A for all scale items), on 9-point scales from “not at all” to “very much so.” Finally, all participants reported their age and gender and were asked whether they looked up dates for any of the events.

Below, we report descriptive statistics, followed by different analyses: (A) Analysis Splitting the Sample by Whether Participants Completed the Survey During or After Quarantine; (B) Analysis Splitting the Sample by Whether Events Occurred Before or During Quarantine; and (C) Analysis Splitting the Sample by Whether Events Occurred Before or During Quarantine and Whether Participants Completed the Survey During or After Quarantine. Continuous variables were mean-centered.

Descriptive Statistics

The median number of events participants remembered was 9 ($SD = 2.53$) and our effective dataset consisted of 8,693 observations (participant-event pairs). As noted earlier, our analyses focus on a subset of the measures we collected, and our complete data are posted online at <https://tinyurl.com/2p9xh45c>. Robustness checks are reported in Appendices A-H.

Select summary statistics for each event are reported in Table 1. On average, participants were in quarantine for 75 days ($SD = 24.31$). Fifteen percent of participants quarantined alone, and 52% reported to be still in quarantine when completing the survey. We coded each “sameness” item such that 1 indicated stronger structure and 9 indicated weaker temporal . The six items formed a reliable scale ($\alpha = .80$). In our analyses, we used a single factor score for sameness (Varimax rotation; eigenvalue = 2.56, variance explained = 43%).¹

[Insert Table 1]

Analysis Splitting the Sample by Timing of Responses: Whether Participants Completed the Survey During vs. After Quarantine

For our first analysis, we regressed participants’ FET for each event on the share of time since the event spent in quarantine (*share*), whether the participant quarantined alone (*alone*), whether the participant was still in quarantine (*still in quarantine*), how well the participant remembered the event (*memorable*) and how emotionally provoking the event was (*emotional*), and the temporal sameness factor score (*sameness*). We also included interaction terms for *share*

¹ We conducted an exploratory factor analysis with the 6-item sameness scale and measures of memorability and emotionality with Promax rotation and extracted three factors with Eigen Value >1. We then conducted a regression using the factor score for sameness scale items and replicated the pattern of results reported in Table 2 (see Appendix B).

and *still in quarantine*, *share* and *quarantine alone*, and *share* and *temporal sameness*.² This regression included dummy variables for each of the 13 events and clustered standard errors at the participant level.³ Table 2 summarizes the results of this analysis. Because it includes event fixed effects, it does not include controls for whether events happened before or during quarantine.

[Insert Table 2]

Individual Characteristics. Events felt more distant for female than male participants ($b = 0.56$, $t(8331) = 3.86$, $p < .001$).⁴ However, controlling for gender did not meaningfully affect our findings. Age, which was shown to affect feelings of elapsed time over very long distances (Wittmann and Lehnhoff 2005), did not affect FET in our survey ($b = 0.00$, $t(8331) = -0.51$, $p = .61$). While these effects were unexpected, we do not explore them further in the current investigation.

Event-Related Variables. Consistent with previous research (Block and Zakay 1997; Bratfisch et al. 1971; Brown et al. 1985), events felt more recent the more memorable ($b = -0.12$, $t(8331) = -3.82$, $p < .001$) and emotional ($b = -0.07$, $t(8331) = -2.49$, $p = .013$) they were.

² We repeated our analysis while controlling for estimated temporal distance (e.g., “how long ago do you *think* April Fool’s Day was”), which is different from FET (e.g., “how distant does April Fool’s Day *feel*”). This did not meaningfully affect our findings (see Appendix C), indicating that quarantine affected FET independently of its effects on estimations of time duration.

³ Clustering standard errors at the participant level was done because participants responded to multiple events, and so there is a within-subject dependency. Participants also responded only to questions about events they were aware of, and differed in when they entered and exited quarantine. Such heterogeneity needed to be taken into consideration in the analysis. Thus, this is a more conservative approach because it accounts for the likely correlation between multiple responses from a single participant. Analysis not clustering standard errors at the participant level results in lower p-values (greater statistical significance) for all reported effects (see Appendix D).

⁴ This analysis groups together participants who identified as “males”, “other”, or who did not report their gender. Removing from analysis the gender of participants who identified as “other” or did not report their gender (~2% of the final sample) did not affect the findings (see Appendix E).

Quarantine-Related Variables. FET slightly contracted for respondents who quarantined alone ($b=-0.19$, $t(8331) = -1.74$, $p = .082$). This effect, which was not statistically significant, is not in line with research suggesting that correlates of isolation (e.g., depression, stress, and boredom) may expand FET (Cellini et al. 2020; Vogel et al. 2018). Sameness expanded FET ($b=0.44$, $t(8331) = 3.13$, $p = .002$). That is, the more days felt similar to one another and lacked structure, the more distant past events were perceived to be. This too is inconsistent with prior research suggesting that sameness may compress FET by decreasing the number of remembered contextual changes (e.g., related intervening effects; Block and Reed 1978; Zauberman et al. 2010). Finally, whether respondents were still in quarantine did not affect FET directly ($b=0.03$, $t(8331) = 0.13$, $p = .90$). We continue to probe these variables through their interactions.

Interactions with the Share of Time Spent in Quarantine. We expected features of quarantine (isolation, sameness, and whether one is still in quarantine) to have a stronger influence on FET the greater the share of time since an event was spent in quarantine. However, we find no interactions between *share* and *quarantine alone* ($b = 0.05$, $t(8331) = 0.14$, $p = .89$) or between *share* and *sameness* ($b = -0.30$, $t(8331) = -0.75$, $p = .45$).

A significant interaction between *share* and *left quarantine* ($b = 1.70$, $t(8331) = 2.18$, $p = .030$) implied that the share of time spent in quarantine had differential effects on FET for people who were still in quarantine and for people who were no longer in quarantine. To test this, we repeated the regression separately for participants still in quarantine and for participants no longer in quarantine (each regression included roughly half of the participants and observations). Table 3 summarizes the results of these regressions.⁵

⁵ In Appendix F, we repeat this analysis while also clustering standard errors at the event level. This does not meaningfully affect the results.

[Insert Table 3]

For participants still in quarantine, *sameness* expanded FET ($b = 0.38$, $t(4426) = 2.61$, $p = .009$), *alone* slightly contracted FET ($b = -0.33$, $t(4426) = -1.67$, $p = .10$), and *share* had no significant effect ($b = -2.06$, $t(4426) = -1.38$, $p = .17$). However, once people left quarantine, the effects of *sameness* and *alone* disappeared ($ps = .43$ and $.75$, respectively), and FET depended on *share* such that the more of the time since an event spent in quarantine, the more distant the event felt ($b = 1.95$, $t(3870) = 3.41$, $p = .001$).

Analysis Splitting the Sample by Timing of Events (Whether Events Occurred Before vs. During Quarantine)

So far, we were unable to test whether FET since events depend on whether they occurred before or during quarantine because the previous analyses include event fixed effect. Table 4 presents results of an additional analysis, which omits event fixed effects and instead considers whether each event occurred before quarantine or during quarantine.⁶ Specifically, we regressed FET for each event on *share*, *alone*, *memorable*, *emotional*, *sameness*, *still in quarantine*, and whether the event occurred pre- or during-quarantine (*Event Pre-Quarantine*), as well as several interaction terms. This analysis clusters standard errors at the participant level.

[Insert Table 4]

⁶ Here we accounted for event timing at the individual participant level. As an additional robustness check, we conducted an analysis accounting for the timing of events at a broader level. Specifically, we split events based on whether they happened before the U.S. government declared COVID-19 a national emergency. This did not meaningfully affect our findings (see Appendix G)

While the results of the regression reported in Table 4 were largely consistent with the pattern of results reported in Table 2, there were some notable discrepancies. The share of time since an event spent in quarantine had a significant compressing effect on FET ($b = -3.45$, $t(8323) = -4.59$, $p < .001$), which had a non-significant effect in the previous analysis. Whether participants were still in quarantine had a significant effect on FET, such that those who were no longer in quarantine perceived events to be closer than those who left quarantine ($b = -0.82$, $t(8323) = -3.14$, $p = .002$). This is different from the results of the previous analysis, where we found a non-significant effect.

Most notably, the three-way interaction between *sameness*, *left quarantine*, and *event pre-quarantine* was marginally significant ($b = 0.44$, $t(8323) = 1.83$, $p = .068$), suggesting that the factors we measured may affect FET differently depending on the position of both events and participants relative to the quarantine period. To test this, we split the regression by whether events happened pre- or during quarantine, with 3,229 observations for events that happened before quarantine and 5,247 for events that happened during quarantine. Table 5 summarizes the results of these regressions. *Sameness* had a significant expanding effect both for events that happened before quarantine ($b = 0.47$, $t(3136) = 3.26$, $p = .001$) and during quarantine ($b = 0.38$, $t(3136) = 1.88$, $p = .060$). The interaction between *left quarantine* and *sameness* was not statistically significant for events that occurred before quarantine ($b = 0.04$, $t(3136) = 0.16$, $p = .87$), but approached significance for events that occurred during quarantine ($b = -0.42$, $t(5155) = -1.50$, $p = .13$).

Table 5. Regression Coefficients for Predicting Feelings of Elapsed Time, Clustering Standard Errors at the Participant Level and Including Event Fixed Effects, for Events that Occurred Before Quarantine (Panel A, With 3217 Observations from 1,026 Participants) or During Quarantine (Panel B, with 5228 Observations from 1,010 Participants)

Variable	(A) Events occurring <i>before</i> quarantine				(B) Events occurring <i>during</i> quarantine			
	B	SE	<i>t</i>	<i>p</i>	B	SE	<i>t</i>	<i>p</i>
Memorable	-0.03	0.04	-0.63	.53	-0.18***	0.04	-5.00	<.001
Emotional	-0.08*	0.04	-2.07	.039	-0.06*	0.03	-2.01	.045
Share	-0.14	1.19	-0.12	.91	1.05*	0.53	2.00	.046
Alone	-0.26+	0.15	-1.80	.072	-0.05	0.12	-0.39	.70
Sameness	0.47***	0.14	3.26	.001	0.38+	0.20	1.88	.060
Left Quarantine	0.14	0.23	0.59	.55	0.48+	0.25	1.95	.052
Share X Alone	0.51	0.57	0.90	.37	-0.48	0.40	-1.20	.23
Share X Sameness	0.10	0.63	0.16	.87	-0.11	0.55	-0.20	.85
Left Quarantine X Share	1.90	1.26	1.51	.13	-	-	-	-
Left Quarantine X Sameness	0.04	0.25	0.16	.87	-0.42	0.28	-1.50	.13
Age	-0.01	0.01	-0.57	.57	0.00	0.01	-0.33	.74
Female	0.60***	0.18	3.29	.001	0.53***	0.16	3.38	.001

Note: *** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$, + $p \leq .10$.

Analysis Splitting the Sample by both the Timing of Events and Timing of Responses in Relation to Quarantine

Following on the three-way interaction between *left quarantine*, *timing of events*, and *sameness*, we broke down the analyses according to the temporal position of both events and participants relative to quarantine (Figure 1, with variables color-coded for ease of comparison across panels). Specifically, we conducted separate analyses for observations depending on whether the event occurred before quarantine and whether the participant was still in quarantine, resulting in four cells: Panel A, in which the event occurred before quarantine and the participant was still in quarantine; Panel B, in which the event occurred before quarantine and the participant was no longer in quarantine; Panel C, in which the event occurred during quarantine and the participant was still in quarantine; and Panel D, in which the event occurred during quarantine and the participant was no longer in quarantine.

These analyses revealed that FET was determined either by *how* people spent their time in quarantine or by *how much* time since an event they spent in quarantine, depending on whether people are still in quarantine at the time of evaluation. While people were in quarantine, FET depended on whether they quarantined alone and the extent to which they maintained a temporal structure (compare panels A+C with panels B+D). Once people leave quarantine, however, FET depended on the share of time since an event spent in quarantine (compare panel A with panels B+D).⁷ In other words, when people leave quarantine, FET becomes dependent on how much time since events was spent in quarantine, instead of how people experienced their time in quarantine. Furthermore, event memorability affected FET only for events that occurred

⁷ The non-significant effect of *share* should be interpreted with caution, because for judgments made during quarantine, there is only one source of variance: variability in the time in which people entered quarantine. However, for judgments made after quarantine, there is also a second source of variance: variability in the time in which people left quarantine. Furthermore, in Appendix H, we conduct an alternative analysis omitting event fixed effects and find that *share* had a significant contracting effect on FET for participants still in quarantine (the effects of sameness and isolation remained similar in both analyses).

during quarantine (compare panels A+B with panels C+D), whereas event emotionality affected FET only for people who were no longer in quarantine (compare panels A+C with panels B+D).

	Participant <i>still in quarantine</i>					Participant <i>out of quarantine</i>				
Event occurred <i>before quarantine</i>	PANEL A  Observations = 1,561 Var = 12.35					PANEL B  Observations = 1,656 Var = 13.83				
		<i>B</i>	SE	<i>t</i>	<i>p</i>		<i>B</i>	SE	<i>t</i>	<i>p</i>
	Memorable	-0.01	0.06	-0.14	.89	Memorable	-0.05	0.06	-0.76	.45
	Emotional	-0.06	0.05	-1.11	.27	Emotional	-0.11 ⁺	0.06	-1.85	.064
	Share	-2.05	1.34	-1.53	.13	Share	2.35**	0.78	3.00	.003
	Alone	-0.39 ⁺	0.21	-1.88	.061	Alone	-0.01	0.22	-0.02	.98
	Sameness	0.48***	0.14	3.51	<.001	Sameness	0.29	0.19	1.51	.13
	Share*Alone	-0.45	0.91	-0.49	.62	Share*Alone	1.10	0.74	1.48	.14
	Share*Sameness	1.36 ⁺	0.70	1.96	.051	Share*Sameness	-0.74	0.78	-0.94	.35
	Age	0.00	0.01	-0.32	.75	Age	-0.01	0.01	-0.53	.60
Event occurred <i>during quarantine</i>	PANEL C  Observations = 2,919 Var = 13.64					PANEL D  Observations = 2,309 Var = 13.37				
		<i>B</i>	SE	<i>t</i>	<i>p</i>		<i>B</i>	SE	<i>t</i>	<i>p</i>
	Memorable	-0.21***	0.05	-4.60	<.001	Memorable	-0.14*	0.06	-2.47	.013
	Emotional	-0.04	0.04	-0.83	.41	Emotional	-0.09 ⁺	0.05	-1.86	.063
	Share					Share	1.50*	0.64	2.36	.018
	Alone	-0.28 ⁺	0.16	-1.72	.085	Alone	0.11	0.19	0.60	.55
	Sameness	0.35***	0.13	2.79	.005	Sameness	-0.01	0.15	-0.05	.96
	Share*Alone					Share*Alone	0.13	0.60	0.22	.82
	Share*Sameness					Share*Sameness	-0.01	0.55	-0.01	.99
	Age	0.00	0.01	-0.38	.71	Age	0.00	0.01	-0.13	.90
	Female	0.53*	0.21	2.49	.013	Female	0.53*	0.23	2.29	.022

Note: *** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$, + $p \leq .10$.

Figure 1. Regression coefficients for predicting feelings of elapsed time according to event and response timing relative to quarantine.

GENERAL DISCUSSION

In a study conducted at the early stages of the COVID-19 pandemic, we investigated how *feelings of elapsed time* (FET) are affected by the share of time since an event that was spent in quarantine, whether people quarantined alone, and the degree of temporal sameness during quarantine. Apart from the importance of investigating time perception in an unprecedented context that greatly affected people's lives around the world, our study tests the relationship between time perception and psychological constructs that cannot be experimentally manipulated at such scale. Our investigation also provided a unique opportunity to test factors that were shown to affect feelings of elapsed time in other, very different, contexts. Most notably, we found that isolation and temporal sameness during quarantine affect subjective time only for people still in quarantine. In contrast, spending a longer time in quarantine since an event affects subjective time only for those who are no longer in quarantine.

Our findings imply that whether people are inside or outside of a particular time period can determine which characteristics of this period affect feelings of elapsed time. When people are inside a time period (in this case, quarantine), feelings of elapsed time depend on how that time period was experienced. When the time period has concluded, feelings of elapsed time depend on its length.

What characterizes a ‘time period’ can differ across people and contexts. In our case, it was the time people spent in quarantine. While this period was unprecedented, our findings have implications for how characteristics of time periods affect feelings of elapsed time. For instance, our investigation revealed that characteristics of a given time period (quarantine) can have differential effects on feelings of elapsed time depending on whether the judgment is made during that time period. To the extent that these judgments then affect decisions, this could have implications for individuals and firms. For instance, feeling that more time has passed since a consumer last engaged in a behavior (e.g., eating middle-eastern food, or going on vacation) may lead them to engage in that behavior sooner than they might have otherwise. Future research is needed to test such implications.

Future research could also further explore the effect of isolation and sameness on feelings of elapsed time. While prior research led us to predict that isolation would expand FET (Cellini et al. 2020; Vogel et al. 2018) and sameness would contract FET (Landau et al. 2018; Zauberman et al. 2010), we found the opposite: isolation contracted FET and sameness expanded it. However, we merely measured, not manipulated, isolation and sameness, which might have been affected by unobserved factors and individual differences. For example, it is possible that people who quarantined alone were more likely to adapt to novel situations and found ways to avoid temporal sameness during quarantine. Indeed, in our study, people quarantining alone experienced lower temporal sameness compared to people who did not quarantine alone, $F(1, 8691) = 11.71, p < .001$.

It is also important to note that our findings were likely affected by the particular features of our study context and design, such as the nature of the time period and quarantine as well as the specific events we included. Therefore, further research is required to test the generalization

of our findings. While we hope this type of global emergency and large-scale closures will not happen again in our lifetime, our findings and implications can be studied in other contexts that include some of the features we probed, even if at a smaller scale, or at the individual, rather than societal level.

The effects of COVID-19 on people's daily structure will last far beyond the period we investigated. For example, people are shifting to relatively flexible work-from-home models (Lund et al. 2021), as professional and even social meetings are moving online. Therefore, it is possible that post-quarantine days may not be as distinct as pre-quarantine days in which daily life had more rigid temporal structures reinforced by well-defined workdays and weekends, commutes, and social necessities. Future research may test whether temporal sameness decreases or increases over time, as well as the interpersonal differences that may determine whether people maintain, or are interested in maintaining, daily structures that are no longer externally imposed.

Finally, it is important to note that given the highly unique context we focused on our study should be taken as more exploratory than as a test of strong theoretical predictions. As such, our analyses are exploratory and our conclusions are driven by correlational evidence. In accordance with the exploratory nature of this investigation, we collected a variety of measures, some of which we did not focus on in this report, that we hope might be of interest to researchers of time perception.

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Table 1. Actual Number of Days Since the Event, the Proportion of Participants Remembering the Event, and Means and Standard Deviations of Feelings of Elapsed Time, Emotionality, and Memorability for Each Event

Event	Actual days since the event (not shown to participants)	% of participants remembering the event	Feelings of elapsed time	Emotionality	Memorability
Mother's Day	34	89	6.77 (3.60)	5.06 (2.37)	6.08 (2.18)
President Donald Trump mentions injecting disinfectants as COVID-19 treatment	50	86	6.38 (3.41)	5.53 (2.53)	6.49 (1.98)
US oil price turn negative	52	50	7.84 (3.27)	3.91 (2.27)	5.46 (1.99)
Easter Sunday	62	71	9.26 (3.33)	3.62 (2.45)	4.91 (2.32)
Bernie Sanders suspends his presidential campaign	66	78	9.32 (3.55)	4.94 (2.58)	5.69 (2.09)
Boris Johnson moves into intensive care with COVID-19	68	61	8.32 (3.25)	3.65 (2.18)	5.27 (2.00)
April Fool's Day	73	67	9.48 (3.53)	2.13 (1.86)	3.97 (2.32)
St. Patrick's Day	88	55	10.85 (3.10)	2.55 (2.12)	4.12 (2.30)
Daylight Savings started	97	45	10.11 (3.59)	2.34 (1.96)	4.24 (2.23)
Super Tuesday (U.S. political primaries)	102	39	10.53 (3.19)	4.35 (2.45)	5.28 (2.29)
Super Bowl (American Football)	132	47	12.44 (3.16)	3.55 (2.53)	5.42 (2.50)
Kobe Bryant dies in a helicopter crash	139	95	10.86 (3.81)	5.95 (2.53)	6.76 (2.02)
Martin Luther King Jr. Day	145	52	11.59 (3.45)	3.45 (2.15)	4.23 (2.22)

Table 2. Regression Coefficients for Predicting Feelings of Elapsed Time; Clustering Standard Errors at the Participant Level and Including Event Fixed Effects

	B	SE	<i>t</i>	<i>p</i>
Memorable	-0.12***	0.03	-3.82	<.001
Emotional	-0.07*	0.03	-2.49	.013
Alone	-0.19+	0.11	-1.74	.082
Share	-0.31	0.77	-0.40	.69
Sameness	0.44**	0.14	3.13	.002
Left Quarantine	0.03	0.23	0.13	.90
Left Quarantine X Share	1.70*	0.78	2.18	.030
Left Quarantine X Sameness	-0.32	0.21	-1.50	.13
Share X Alone	0.05	0.34	0.14	.89
Share X Sameness	-0.30	0.40	-0.75	.45
Age	0.00	0.01	-0.51	.61
Female	0.56***	0.14	3.86	<.001

Note: *** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$, + $p \leq .10$.

Table 3. Regression Coefficients for Predicting Feelings of Elapsed Time, Clustering Standard Errors at the Participant Level and Including Event Fixed Effect, for Participants Still in Quarantine (Panel A, with 4464 Observations from 540 Participants) and for Participants No Longer in Quarantine (Panel B, with 3914 Observations from 500 Participants)

	(A) Still in quarantine				(B) No longer in quarantine			
	B	SE	<i>t</i>	<i>p</i>	B	SE	<i>t</i>	<i>p</i>
Memorable	-0.14***	0.04	-3.47	.001	-0.10*	0.05	-2.13	.033
Emotional	-0.04	0.04	-1.11	.27	-0.10*	0.04	-2.30	.021
Alone	-0.33+	0.20	-1.67	.10	0.06	0.17	0.33	.75
Share	-2.06	1.50	-1.38	.17	1.95***	0.57	3.41	.001
Sameness	0.38**	0.14	2.61	.009	0.11	0.14	0.79	.43
Share X Alone	0.05	0.55	0.09	.93	0.70	0.53	1.32	.19
Share X Sameness	0.10	0.46	0.22	.83	-0.53	0.52	-1.04	.30
Age	0.00	0.01	-0.44	.66	0.00	0.01	-0.27	.79
Female	0.55*	0.20	2.75	.01	0.56**	0.21	2.70	.007

Note: *** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$, + $p \leq .10$.

Table 4. Regression Coefficients for Predicting Feelings of Elapsed Time, Clustering Standard Errors at the Participant Level

Variable	B	SE	<i>t</i>	<i>p</i>
Memorable	-0.16***	0.03	-5.16	<.001
Emotional	-0.13***	0.03	-4.82	<.001
Share	-3.45***	0.75	-4.59	<.001
Alone	-0.19+	0.11	-1.75	.08
Event-Pre-Quarantine	1.84***	0.20	9.25	<.001
Sameness	0.32+	0.19	1.72	.086
Left Quarantine	-0.82**	0.26	-3.14	.002
Share X Alone	0.00	0.35	0.01	.99
Share X Sameness	-0.06	0.48	-0.13	.90
Left Quarantine X Sameness	5.37***	0.84	6.37	<.001
Left Quarantine X Sameness	-0.42	0.26	-1.58	.11
Left Quarantine X Event Pre-Quarantine	0.92***	0.23	3.93	<.001
Event Pre-Quarantine X Sameness	0.15	0.18	0.83	.41
Event Pre-Quarantine X Left Quarantine X Sameness	0.44+	0.24	1.83	.068
Age	0.00	0.01	-0.38	.70
Female	0.59***	0.15	4.06	<.001

Note. The interaction between *share*, *person in/out of quarantine*, and *event pre/during quarantine* could not be calculated because *share* was 1 when an event happened during quarantine and a person was still in quarantine. *** $p \leq .001$, ** $p \leq .01$, * $p \leq .05$, + $p \leq .10$.