Short-Term Effects of Short-Term Work

Dynamics in Fatigue Across Two National Lockdowns

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Objective: Anecdotal evidence suggests work fatigue has increased during the COVID-19 pandemic, and work interventions to offset stresses have been effective. Our study sought to test these propositions, documenting and describing the complexity of worker well-being around two lockdown periods. **Methods:** Using 17 waves of data from a longitudinal study in Germany (December 2019 to June 2021, n = 1053 employees), we model discontinuous changes in work fatigue and how participation in a government-sponsored short-term work program (Kurzarbeit) affected change trajectories. **Results:** The COVID-19 pandemic has not invariably resulted in work fatigue, and individuals with Kurzarbeit at the first lockdown (but not the second) showed significantly larger decreases in each form of fatigue at this transition. **Conclusions:** Future policy interventions will require more contextual nuance and to effectively support worker well-being during public health crises.

Keywords: COVID-19, discontinuous growth modeling, Kurzarbeit, pandemic, work fatigue

Much as masks, social distancing guidelines, and handwashing have dominated public discourse during the COVID-19 pandemic, various discussions of the prevalence of fatigue or exhaustion during the pandemic emerged as well. Whether billed as "pandemic fatigue" or "crisis fatigue," the depleting and tiresome nature of the COVID-19 pandemic—not to mention the idea that this depletion is cumulative and worsens over time—has been widely espoused but not widely examined empirically.[1] At the same time, some have heralded the COVID-19 pandemic as a catalyst for better work-life balance, particularly for individuals with good job security and flexible employment and family responsibilities. In addition to these opposing anecdotal discussions, empirical work has been similarly mixed, with some research observing well-being decrements among individuals[2,3] and others reporting well-being stability or improvements over time or as a function of other factors.[4–6] Although some studies (reviewed more later) have involved data collected over time, much of this research has been cross-sectional in nature,[7,8] only producing "snapshots" of worker well-being at isolated time points.

Thus, we lack research investigating the over-time direction and dynamics of worker well-being, particularly relative to identifiable pandemic-related events (eg, lockdowns). We focus herein on employees and work fatigue, given the significant work changes that the COVID-19 pandemic has prompted.[9] Between contextual and environmental changes, procedural adjustments and work process reengineering, novel communication modes and norms, and health and safety risks (in addition to many other challenges), workplaces are replete with new demands and arrangements for employees. However, these changes, demands, and arrangements are not necessarily deleterious under all conditions or over time. Indeed, competing narratives can be convincingly argued through not only "common wisdom" but theoretical perspectives as well, and intervening factors (eg, personal circumstances, policies) further complicate or diversify our predictions.

A particularly salient example of this in the COVID-19 pandemic context is the involvement of government agencies and policymakers in mitigating pandemic-related stresses (eg, those associated with health concerns, financial worries, imposed lockdowns). As many businesses were forced to drastically alter their modes of work, reduce their workforce, or shutter their doors altogether, governments provided varying levels of financial assistance to employers and employees alike. Whether alleviating job insecurity or providing additional resources to reduce financial stress, many of these state-based benefits programs have distinctive characteristics and configurations but relatively unknown effects.

In this study, we explore the influence of two national lockdown periods in Germany on discontinuous changes in three dimensions of work fatigue—mental, physical, and emotional. *Physical fatigue* involves extreme physical tiredness and an inability to engage in physical activity, whereas *mental fatigue* is characterized by extreme mental tiredness and an inability to think or concentrate. *Emotional fatigue* involves severe emotional tiredness and an inability to feel or show emotions.[10] We use data from an ongoing longitudinal study of work and well-being and consider 17 longitudinal measurement waves from December 2019 to June 2021. Beyond describing discontinuous changes in work fatigue across this time span, we consider how short-term work benefits offset challenges and meaningfully sustain well-being (ie, reduce work fatigue) under stressful employment conditions. Thus, in addition to focusing on charting work fatigue among employees, our study considers the specific well-being effects of a government-sponsored short-term work program, *Kurzarbeit*, in Germany. This program entitles employees to a short-term work allowance with reduced hours but continued income during economic and employment crises.

Collecting data before, during, and after notable events or societal changes is often a wonderful idea in hindsight.[11] Unfortunately, we do not have the ability to predict most major crises, nor can we often pinpoint definitive "turning points" in more progressive and slow-moving shifts (eg, due to the nature of such shifts, such as globalization or digitization). Ongoing longitudinal data collections thus present a unique opportunity for investigations when major events or crises transpire and when distinct changes such as governmental mandates (eg, national lockdowns) occur within these periods. We discuss relevant theoretical and empirical perspectives on events and interventions in the following sections to contextualize our study. Particularly as multi–time-point studies conducted so far during the COVID-19 pandemic have generated mixed results, more research is needed to investigate what accounts for this heterogeneity in such effects, which will allow for the (re)alignment of theory with these findings. Both how we model change and what moderating variables we consider are particularly pertinent areas upon which to focus; the background we review next informs our model choice in addition to our focus on short-term work as a moderator.

Events, Transitions, and Crises

We know that it is important to consider events and transitions in our study of organizations.[12] Still, there is a relative paucity of

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comprehensive theorizing around transitions and the events that precipitate them, which is likely due to methodological and statistical limitations faced by researchers until recent years (eg, inability to collect certain types of data, to model different forms of change[11]). This means that what we believe or think we know about events, transitions, and crises is, at present, quite limited to nascent theorizing and colloquial beliefs about change, as well as cross-sectional research that cannot assess such dynamics.

In the specific case of COVID-19, various cross-sectional studies have been published purporting to test how the sudden onset and prolonged duration of the pandemic have impacted individual well-being in and outside work. By and large, these studies are presented to support a common narrative around major global events: individuals invariably experience stress, fatigue, and well-being decrements when faced with sweeping threats, conflicts, and changes in society, although certain personal and environmental factors may exacerbate or mitigate these effects.[13–15] Cross-sectional data, however, cannot be used to make causal claims, which leaves us a multitude of explanations for observed relationships between variables at a single time point (eg, additional variables, reverse causality, timing issues). Moreover, cross-sectional studies give us a single snapshot of data, which can tell us nothing definitive about well-being levels before an event nor how well-being may be dynamic over a longer period (eg, as an event evolves, its effects amplify or diminish).

Longitudinal data collections (and accompanying analytical methods), however, allow us to study change and stability over time, and on the basis of the theoretical perspectives discussed next, predictions for these studies could conceivably be framed in a variety of ways. Indeed, these theories are general enough to support predictions of well-being maintenance, decrements, or even improvements. Each theory is based on an underlying assumption that changes affect people in general; however, from these theories, it is unclear how changes affect fatigue, specifically. Although the theories make predictions about how events shape logical experiences, they do not present global predictions about fatigue or well-being.

Morgeson and colleagues[12(p520)] (2015) define "events" as "external, bounded in time and space, and involv[ing] the intersection of different entities." This definition is broad enough to capture quite a variety of phenomena and is made more specific in considering other characteristics of events such as strength, space, and time. Each of these dimensions encompasses a range of subcomponents that can be used to characterize events and form general ideas about the magnitude of their effects on information processing, reactions, and outcomes: *event strength* includes the novelty, disruptiveness, and significance of an event; *event space* entails the origin and spread of an event; and *event time* refers to an event's duration, occurrence relative to other events, and dynamics. Put simply, events entail actions or environmental conditions outside the affected individual(s), these actions or conditions have a clear beginning and end (ie, are discrete) and interrupt routines (ie, prompt discontinuity), and events can vary in a multitude of fashions that shape what change they prompt.

In these terms, the COVID-19 pandemic can be defined in a variety of ways: in terms of its unprecedentedness and major influence and disruption of "normal" life, in terms of its multilevel, multifocal, and global manifestations (ie, by geographic region, by unit of influence; eg, safety protocols, lockdowns, organizational closure), or even in terms of its evolution over time and coincidence with other societal events. This detail is descriptive about *whether* and *how much* the pandemic might affect people (ie, by shaping information processing, behaviors, other events). However, it does not provide specific guidance for well-being outcomes such as fatigue, nor does it suggest much more than that change will affect individuals in some way or another, depending on other factors.

Transition perspectives take the "change affects people" idea a step further and discuss well-being consequences of and circumstances around discrete events. Adler and Castro[16] (2019) define "transitions" as passages from one state to another that vary in meaningfulness or significance; they also discuss five assumed characteristics about transitions, including that they are inevitable (a fact of life, occurring at both small and large scales) and artificial (not discrete, better defined by lead-up and follow-up periods), provide opportunities (can result in positive and negative reactions and changes), occur at multiple levels (involve individuals and organizations, and span various domain boundaries), and present paradoxes (instigate innovation and change while also disrupting predictability and routine). Some of these propositions about transitions align quite well with Morgeson and colleagues' discussion of events (eg, both entail routine disruption, involvement of multiple entities), whereas others diverge (eg, discrete vs nebulous event boundaries). In addition, Adler and Castro's (2019) discussion focuses on how individuals adjust to transitions in their personal and professional lives, leveraging personal and contextual supports to bolster functioning (well-being, performance) before, during, and after change.

This is not to say that the two perspectives are mutually exclusive; in fact, they are complementary to one another, connecting the ideas that events and the time preceding and following them have implications for health and well-being. Considering the COVID-19 pandemic, this suggests that (a) the periods before and after specific pandemic-related events (eg, lockdowns, work closures and interventions) are just as important to consider as the events themselves and, relatedly, (b) multiple phases and events can co-occur, overlap, and influence each other over time, with impacts on how individuals and other entities respond. Thus, although we "know" these general principles about transitions, timing, and their effects, we do not have data testing them. To bridge this gap, we should not only have a focus *on* but also *around* events to understand whether and how periods of discontinuity affect individual well-being.

A yet further "drilled down" perspective to consider is that of disaster science, which provides a catastrophe-based perspective on pandemic responses, including how individuals respond to various precautionary measures (eg, evacuation, quarantine).[17] This area considers both inciting events, which vary in their predictability and duration, as well as the transitions that occur around these crises (eg, in response to them; to prevent further harm, mitigate adverse effects, or aid recovery). More so than the transitions perspective, disaster science considers how the unique context of threat, stress, uncertainty, and danger shapes the effectiveness and viability of certain interventions—and how the outcomes of events and interventions may evolve in concert. For example, compliance with public health policies may increase or decrease over time because of factors such as individual well-being and motivation, just as other interventions may be more or less effective depending on what needs they fulfill (eg, reducing uncertainty, risk).

There are two fundamental pieces of knowledge here: first, that crises and catastrophes, as well as their lead-up (when predicted or foreseen) and aftermath, bear a particularly negative valence, and second, that time is a critical factor in determining behaviors and outcomes in the context of threat, turmoil, and loss (eg, of control, of normalcy). Thus, we should not only have a focus *on* and *around* events; rather, we need to consider events *in the context of stress and danger* to determine how individual well-being as well as macro-level policy decisions intersect, specifically during crisis-related events and transitions. To address these points and the mixed findings reported in the literature, we designed our study to explore potential mechanisms by which well-being is affected by events (ie, lockdowns, a short-term work intervention) and how these processes unfold over time (ie, by modeling change dynamically and discontinuously).

Short-Term Work Interventions

In the organizational sciences, there is often little discussion of state-level policies in relation to the workplace and employee well-being,

although such interventions hold great promise as mechanisms for buffering or improving well-being. Most studies pose general "policy recommendations" based on their findings, but we do not do much theorizing about or testing of policy in relation to work and worker variables. There is an abundance of reasons for this, including the inconsistent application of policy relative to available samples, the challenges of assessing policy intervention outcomes in time frames that are both feasible and informative, or even the prioritization of broad economic investigations rather than focused individual studies.

One short-term work intervention of relevance to workers during the COVID-19 pandemic, as well as one that mitigates the challenges of policy-inclusive research outlined previously, is Germany's short-term work sharing program. Known as *Kurzarbeit*, this government-sponsored program provides supplemental income to workers during periods of lower employment demands, allowing more individuals to stay employed with their organization (albeit for fewer hours) and receive between 60% and 70% of their pay during challenging economic times, for up to 24 months. This labor market policy has been lauded and recommended for other contexts and nations,[18] most recently during the COVID-19 pandemic.[19] However, little research has considered how short-term work may affect well-being[20] and, relatedly, to what extent these programs result in meaningful and sustainable benefits for individuals (vs economies) during challenging events, transitions, and crises.

In our study, we sought to answer two questions through the event-, transition-, and crisis-rich COVID-19 pandemic context. First, what are the effects of state-imposed lockdowns on different types of work fatigue among employed individuals during the COVID-19 pandemic? Second, what are the effects of broader governmental influence, specifically short-term unemployment interventions, under these conditions? On the basis of the literature and perspectives reviewed previously, we model discontinuous trajectories of well-being relative to state-imposed COVID-19 lockdowns. Furthermore, in line with the objectives of the Kurzarbeit program, we expected that individuals who participated in this short-term work program would demonstrate less fatigue than those who did not receive these benefits.

METHODS

Transparency and Openness

In service of transparency and openness, the deidentified data on which the study conclusions are based, the analytic code needed to reproduce the analyses in R, and complete results of all focal as well as supplemental analyses are available in our online appendix: https://osf.io/2t8wg/. The data used in this paper were collected as part of a larger longitudinal data collection effort. Six articles based on the same dataset, but with completely different research questions, have been published.[21–26] One of these manuscripts makes use of the T1, T2, and T5 assessments of emotional fatigue and relates them to perceptions of leadership.22 The study reported in this article is funded by Volkswagen Foundation (Az. 96 849-1, "Work and Health in the Time of COVID-19: A Longitudinal Study").

Sample and Procedure

In this study, we consider a sample of $n = 1053$ employed adults in Germany who responded to monthly surveys in December 2019 (ie, Time [T] 1 "baseline") and March 2020 to June 2021 (ie, T2 to T17), for a total of 17 waves of longitudinal data collected during the first week of each month.

A professional survey panel management company was commissioned to recruit participants from a nationally representative online panel in Germany. The company is ISO 26362 certified, which ensures quality of the survey data. To be eligible to participate, participants had to be at least 18 years old and be working full-time at each measurement wave. At T1, $n = 4{,}839$ persons in the company's database were contacted. Of these persons, $n = 2{,}976$ initiated the survey and provided at least partial responses (eg, demographics, substantive variables; initial response rate of 61.50%) to the T1 survey. Of these $n = 2{,}976$ persons, $n = 1{,}053$ provided responses for at least some of the 17 time points on either demographic or substantive variables. Missing data is a common occurrence in survey research, especially in longitudinal designs. As such, and following the advice of Newman[27(p384)] (2014), we specified our models using "all the available data." Notably, unconditional models are based off $n = 1{,}042$ respondents who provided at least some data on work fatigue across all 17 time points, whereas conditional models are based off $n = 590$ respondents who reported Kurzarbeit status at T4 and T11 (see description below and sample sizes reported in Table 1; at T4, $n = 108$ respondents reported being on Kurzarbeit; at T11, $n = 38$ respondents reported being on Kurzarbeit).

MEASURES

Work Fatigue

At each time point, we collected measures of work fatigue using nine items from Frone and Tidwell's[10] (2015) three-dimensional work fatigue inventory. The three highest-loading items from the subscales for physical, mental, and emotional work fatigue were used, and ratings were provided on a 7-point frequency scale ranging from 1 = *never* to 7 = *always*. Example items are as follows: "During the past 4 weeks, how often did you…" "…feel physically exhausted at the end of the workday?" "…feel mentally drained at the end of the workday?" and "…feel emotionally worn out at the end of the workday?" Please note that, for T1 and T2, the instructions referred to "the past 3 months" as we only switched in April 2020 to monthly data collections due to the COVID-19 pandemic; the study was originally planned to include four measurement waves and time lags of 3 months. A confirmatory factor analysis on T1 data confirmed the three-factor structure of this scale ($\chi^2_{24} = 337.563$, $p < .001$, comparative fit index = 0.973, root mean square error of approximation = 0.082, standardized root mean-square residual = 0.035; see online appendix for complete results), and internal consistency reliability estimates were very good, ranging from $\alpha = .927$ to .958.

Kurzarbeit

We asked participants whether they were on Kurzarbeit during the past 4 weeks (ie, "no" or "yes") at T4 (ie, May 2020, referring to the onset of the lockdown period between early April 2020 and early May 2020) and T11 (ie, December 2020, referring to the onset of the lockdown period between early November 2020 and early December 2020).

ANALYSIS

To model changes in work fatigue over time, we used *unconditional* discontinuous growth modeling in a mixed effects modeling framework.[28] Such models allowed us to explore the effects of lockdown periods on physical, mental, and emotional fatigue by explicitly modeling pretransition, transition, and recovery effects associated with discrete events.[11] In this case, we consider the onset of two distinct national lockdown periods in Germany, occurring in early April 2020 and early November 2020, to be such events. Our models allow for simultaneously modeling of two distinct transition points and two subsequent recovery periods associated with the onsets of the lockdowns.

We likewise consider Kurzarbeit as a moderator of the effects of transition and recovery in a second set of *conditional* discontinuous growth models. Statistically significant (ie, $P < 0.05$) interactions between Kurzarbeit and transition and/or recovery parameters can be interpreted as evidence that short-term work variously affected trajectories of work fatigue over time.

Before specifying our focal discontinuous growth models, we tested for systematic effects of attrition over time and measurement

TABLE 1. Summary of Unconditional and Conditional Discontinuous Growth Models

	Physical Fatigue			Physical Fatigue			Mental Fatigue			Mental Fatigue			Emotional Fatigue			Emotional Fatigue		
Model Terms	*γ*	**SE**$_\gamma$	***P***	*γ*	**SE**$_\gamma$	***P***	*γ*	**SE**$_\gamma$	***P***	*γ*	**SE**$_\gamma$	***P***	*γ*	**SE**$_\gamma$	***P***	*γ*	**SE**$_\gamma$	***P***
(Intercept)	4.017	0.049	< 0.001	3.874	0.069	< 0.001	3.771	0.049	< 0.001	3.622	0.069	< 0.001	3.203	0.048	< 0.001	3.132	0.068	< 0.001
Time pre	−0.103	0.010	< 0.001	−0.089	0.012	< 0.001	−0.100	0.009	< 0.001	−0.091	0.012	< 0.001	−0.083	0.009	< 0.001	−0.085	0.012	< 0.001
Trans (TR) 1	−0.244	0.031	< 0.001	−0.237	0.040	< 0.001	−0.174	0.030	< 0.001	−0.162	0.039	< 0.001	−0.082	0.029	0.005	−0.083	0.038	0.030
Recov (RC) 1	−0.011	0.006	0.081	−0.031	0.008	< 0.001	−0.015	0.006	0.013	−0.034	0.007	< 0.001	−0.010	0.006	0.092	−0.020	0.007	0.005
TR 2	−0.484	0.034	< 0.001	−0.566	0.039	< 0.001	−0.368	0.033	< 0.001	−0.427	0.039	< 0.001	−0.222	0.032	< 0.001	−0.244	0.038	< 0.001
RC 2	−0.009	0.007	0.163	−0.013	0.007	0.078	−0.009	0.007	0.190	−0.012	0.007	0.106	−0.009	0.006	0.155	−0.013	0.007	0.068
T4 Krzrbt (KRZ)				0.381	0.179	0.033				0.358	0.182	0.049				0.267	0.178	0.134
T11 KRZ				0.329	0.238	0.167				0.328	0.242	0.176				0.461	0.238	0.052
TR 1 × T4 KRZ				−0.484	0.086	< 0.001				−0.430	0.085	< 0.001				−0.275	0.082	0.001
RC 1 × T4 KRZ				0.126	0.022	< 0.001				0.115	0.021	< 0.001				0.080	0.021	< 0.001
TR 2 × T11 KRZ				−0.103	0.118	0.381				−0.132	0.116	0.257				−0.190	0.113	0.091
RC 2 × T11 KRZ				−0.005	0.032	0.887				0.003	0.031	0.922				0.006	0.030	0.842
Random effects																		
σ^2	0.83			0.77			0.79			0.75			0.74			0.71		
τ_{00}	1.71 $_{ID}$			1.75 $_{ID}$			1.75 $_{ID}$			1.81 $_{ID}$			1.70 $_{ID}$			1.75 $_{ID}$		
ICC_1	0.67			0.69			0.69			0.71			0.70			0.71		
N	1,042 $_{ID}$			590 $_{ID}$			1,042 $_{ID}$			590 $_{ID}$			1,042 $_{ID}$			590 $_{ID}$		
Observations	13,456			9,328			13,456			9,328			13,456			9,328		
R^2_{Within}	0.0789			0.1358			0.0599			0.1013			0.0327			0.0802		

Krzrbt, Kurzarbeit; *P*, *P* value associated with estimate; Recov, recovery; R^2_{Within}, within-person variance explained estimate (ie, Raudenbush & Bryk formulae); SE$_\gamma$, standard error of estimate; Time Pre, time before the first transition; Trans, transition; γ, estimate.

invariance for our measure of work fatigue. Considering the procedures outlined by Goodman and Blum[29] (1996), evidence for attrition effects was minimal, with focal variables and demographics accounting for less than 3% of the observed variance in attrition patterns. Table 2 provides descriptive statistics on demographic and substantive variables between complete and incomplete responders at T1. Likewise, following the advice of Cheung and Rensvold[30] (2002), evidence for measurement invariance was upheld with respect to relative indices of model fit. A full accounting of both analyses is available in our online appendix.

RESULTS

Table 2 contains descriptive statistics on demographic and substantive variables measured at T1. Given the number of variables and time points considered here (ie, three dimensions of work fatigue; 17 time points), complete descriptive statistics for this sample, including tables of intercorrelations among substantive variables, can be found in our online appendix. Table 1 shows the results of the three models specified to explore discontinuous trajectories of change in physical, mental, and emotional fatigue, and Figure 1 (panels A to C) graphically depicts the predicted discontinuous trajectories. Statistically significant parameter estimates reported here are interpreted at 95% confidence (ie, $P < .05$). All three models suggest that, initially, each form

TABLE 2. Descriptive Statistics for Incomplete and Complete Responders at Time 1

	Incomplete (*N* = 1,923)	Complete (*N* = 1,053)	*P*
Sex			
Male	368 (19.1%)	611 (58.0%)	< 0.001
Female	484 (25.2%)	439 (41.7%)	
Missing	1071 (55.7%)	3 (0.3%)	
Age, y			
Mean (SD)	43.8 (12.5)	44.4 (10.9)	0.213
Median [Min, Max]	44.0 [19.0, 99.0]	45.0 [18.0, 69.0]	
Missing	1065 (55.4%)	0 (0%)	
Education			
Lower secondary school	79 (4.1%)	65 (6.2%)	0.039
Intermediate secondary school	291 (15.1%)	396 (37.6%)	
Upper secondary school	157 (8.2%)	176 (16.7%)	
College/university or technical college	322 (16.7%)	406 (38.6%)	
Missing	1074 (55.9%)	10 (0.9%)	
Monthly household income, euros/mo			
0–999	98 (5.1%)	50 (4.7%)	< 0.001
1000–1999	147 (7.6%)	174 (16.5%)	
2000–2999	188 (9.8%)	240 (22.8%)	
3000–3999	176 (9.2%)	226 (21.5%)	
4000–4999	132 (6.9%)	191 (18.1%)	
5000–5999	59 (3.1%)	95 (9.0%)	
6000–6999	58 (3.0%)	77 (7.3%)	
Missing	1065 (55.4%)	0 (0%)	
T1 physical fatigue			
Mean (SD)	4.20 (1.49)	3.97 (1.46)	0.003
Median [Min, Max]	4.00 [1.00, 7.00]	4.00 [1.00, 7.00]	
Missing	1369 (71.2%)	0 (0%)	
T1 cognitive fatigue			
Mean (SD)	3.88 (1.50)	3.73 (1.48)	0.048
Median [Min, Max]	4.00 [1.00, 7.00]	4.00 [1.00, 7.00]	
Missing	1369 (71.2%)	0 (0%)	
T1 emotional fatigue			
Mean (SD)	3.15 (1.58)	3.17 (1.54)	0.809
Median [Min, Max]	3.00 [1.00, 7.00]	3.00 [1.00, 7.00]	
Missing	1369 (71.2%)	0 (0%)	

Max, maximum; Min, minimum.

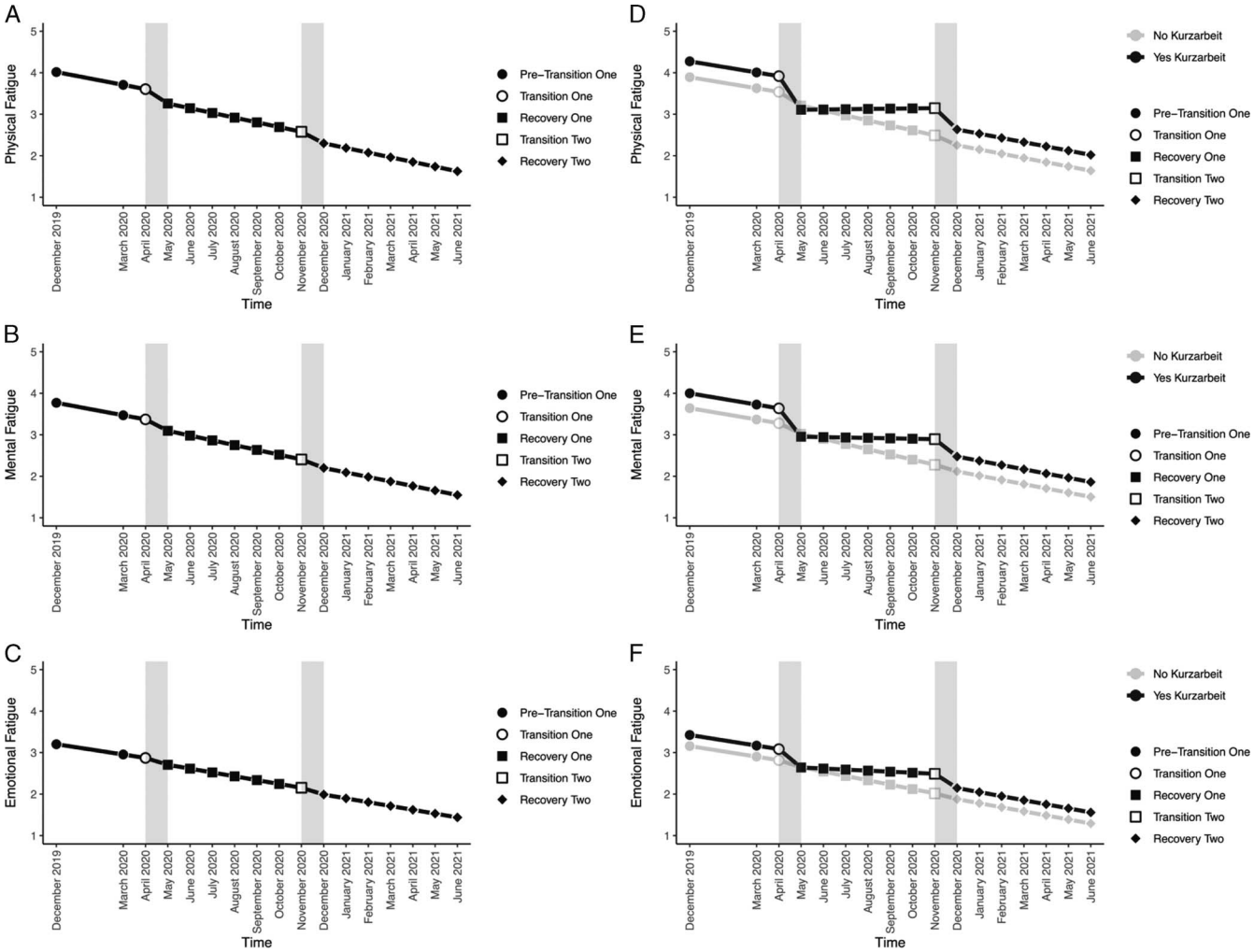

FIGURE 1. Predicted Trajectories of Unconditional and Conditional Discontinuous Growth Models.

of fatigue showed statistically significant declines between the baseline survey (December 2019) and the first lockdown period (April 2020; physical, $\gamma_{pre} = -0.103$; mental, $\gamma_{pre} = -0.100$; emotional, $\gamma_{pre} = -0.083$). Likewise, all three forms of fatigue showed statistically significant transitions during the first national lockdown (physical, $\gamma_{trans1} = -0.244$; mental, $\gamma_{trans1} = -0.174$; and emotional, $\gamma_{trans1} = -0.082$); the negative sign of these parameter estimates suggests a demonstrable decline in these forms of fatigue resulting from the first national lockdown period. Complementing these observations, all three forms of fatigue also showed statistically significant transitions during the second national lockdown (physical, $\gamma_{trans1} = -0.484$; mental, $\gamma_{trans1} = -0.368$; and emotional, $\gamma_{trans1} = -0.222$); again, the negative sign of these parameter estimates suggests a demonstrable decline in these forms of fatigue resulting from the second lockdown period. The only recovery effect after the first lockdown that was found to be statistically significant was observed for mental fatigue ($\gamma_{trans1} = -0.484$), suggesting that mental fatigue continued to decline in the period between the first and second lockdowns. No significant recovery effects were observed after the second lockdown.

Table 1 shows the results of the three models specified to explore whether the observed discontinuous trajectories of change in physical, mental, and emotional fatigue were conditional upon participation in Kurzarbeit. We find the participation in Kurzarbeit during the first lockdown modified the strength of the associated transition and recovery effects. As depicted in Figure 1 (panels D to F), participation in Kurzarbeit was associated with steeper negative transitions (physical, $\gamma_{trans1} = -0.484$; mental, $\gamma_{trans1} = -0.430$; and emotional, $\gamma_{trans1} = -0.275$) for each dimension of fatigue. This suggests that work fatigue of those participating in Kurzarbeit declined more strongly during this time. However, those who participated in Kurzarbeit during the initial lockdown experienced subsequently *positive* recovery effects (ie, increases in fatigue)[11] for each dimension (physical, $\gamma_{trans1} = 0.126$; mental, $\gamma_{trans1} = 0.115$; and emotional, $\gamma_{trans1} = 0.080$). Notably, participation in Kurzarbeit during the second lockdown was not found to modify the strength or direction of transition or recovery effects for any dimensions of fatigue. Thus, it seems that, at least initially, participation in Kurzarbeit reduced work fatigue, but this effect diminished rather quickly (ie, within 1 month) as fatigue increased for those workers shortly after the onset of the first lockdown period. Moreover, in later phases of the COVID-19 pandemic, Kurzarbeit did not seem to have effects on work fatigue anymore.

DISCUSSION

With our data, we were able to focus our study on and around events, as well as these events in the context of stress and danger. At least in the cases we examined, the COVID-19 pandemic has not invariably resulted in stable and progressive (work) fatigue. Rather, workers' physical, mental, and emotional fatigue showed significant decreases at the first lockdown transition, which remained relatively

stable for physical and emotional fatigue (ie, evidenced by nonsignificant recoveries in physical and emotional fatigue) but not for mental fatigue (ie, evidenced by significant decreases in mental fatigue) during the period after the first lockdown. It is possible that this is a product of some employers' proactive decision to close offices in advance of government lockdowns, as COVID-19 had already "arrived" by this time. This pattern was generally mirrored at the second lockdown transition and followed a similar pattern of decline and then stability in fatigue in the ensuing months. One explanation for this finding may be that those with steeper previous declines have more to "recover" in terms of fatigue increases. These dynamics and trajectories must be considered not only relative to state-imposed COVID-19 lockdowns but also within the context of Kurzarbeit program participation. Consistent with our expectations, the short-term work intervention we studied (Kurzarbeit) was a significant moderator across the board at the first lockdown period. However, Kurzarbeit was not a significant moderator at the second lockdown: compared with those without, individuals with Kurzarbeit at the first lockdown showed significantly larger decreases in each form of fatigue at this transition, but their fatigue then significantly increased during the first recovery period and returned more or less to "baseline" levels.

Thus, the impact of short-term work interventions seems to be relatively short lived and differentially effective (ie, based on lockdown timing and occupational context). Perhaps, then, this intervention is useful for counteracting or masking select early pandemic-related stressors among individuals (or continuing to do so at a more macroeconomic level), but not for directly addressing these stressors or doing so sustainably. Although each of the theoretical perspectives we discussed at the outset of this article provides conceptual fodder for research at a general level, there remain large gaps between their applicability, assumptions, and level of detail on the one hand, and the realities of the COVID-19 pandemic, associated lockdowns, and fatigue narratives on the other hand. As such, and as evidenced by recent literature, there are a multitude of ways that well-being could be predicted to behave in response to the pandemic (eg, increases, decreases, relative stability) both over time and in the context of intervening factors. To chart and account for heterogeneity in well-being trajectories, we designed our study on, around, and in the context of the COVID-19 pandemic, collecting data over time and with a mix of individuals using short-term work benefits and those who were not.

Moreover, our modeling method focused around two discrete events (pandemic lockdowns), the periods before and after these events, their effects on fatigue, and their interaction with a short-term work intervention. This allowed us to apply and investigate general, and largely untested theoretical, propositions (eg, change affects people and their well-being; circumstances and transitions around events are influential for individual outcomes as well as other events; the nature and timing of events matter for well-being) and do so specifically in the context of a potential moderating factor (ie, Kurzarbeit participation). Accounting for (dis)continuity and variability therein allows us to better predict the results of future events and formulate effective policy in response.

THEORETICAL IMPLICATIONS AND FUTURE RESEARCH DIRECTIONS

From a theoretical perspective, there is clearly a need to think more about events, transitions, and crises as they are, rather than retrofitting our definitions to fit the limitations of our research design, analytic approaches, or theory-building capacity. To do so, more discovery-oriented work is needed, because this will allow for theory to emerge from and therefore better represent reality. It may be, for instance, that more event-specific theorizing or typologies are needed, particularly to understand the diverse ways individuals respond to different types of change and intervention. Interested researchers should consider using similar study designs and analytic approaches around other discrete events in and outside the work environment, as well as in the context of different policy interventions. We specifically recommend that work be done to encourage theory that builds upon and specifies the event, transition, and disaster science perspectives discussed earlier. On the basis of the results of our study, greater attention to event timing and moderating personal and contextual factors is needed; this can be included in theoretical elaborations as well as tested in future research.

In addition, future research should be conducted in reference to different events, transitions, and/or disasters at different "scales." This would entail studies at different time scales (ie, time lags, overall study duration including "shortitudinal studies"),[31,32] measurement modes (eg, multisource data, experimental paradigms),[33] and contextual levels within which events emerge and wield influence (within work units, organizations, communities, and cultures).[34] Individuals and systems continuously undergo changes and challenges, and greater attention to when and how focal units adapt is needed.[35] Alternative modeling and analytic methods that account for within- and between-unit change may be appropriate to use here as well (eg, continuous time structural equation modeling)[32] in addition to leveraging simulations and computational modeling to build and test theory.[36] This latter approach helps bypass the challenges of conducting research around unpredictable events.

LIMITATIONS

Our study is not without its limitations, of which we discuss three in particular and in reference to future research directions. First, our study was conducted in a relatively specific sample and context: German full-time workers participating in a multiwave longitudinal study during the COVID-19 pandemic, some of whom participated in Kurzarbeit. This necessarily constrains the generalizability of our results and informs how they can and should be extrapolated to other economic, cultural, and political environments. Second, although we used a validated and well-justified scale for assessing work fatigue, short versions of scales pose risk of insufficient content coverage. A related concern can be raised regarding our operationalization of discrete events and chosen time lags, because there may be finer detail within and around the lockdown periods that were obscured by our time lags and "when" we modeled the lockdowns to have occurred (ie, their onset). Future work could use alternative fatigue scales (including domain-general fatigue) as well as consider other outcomes and data collection schemes that might demonstrate differential trajectories over time. Third and finally, there are a wealth of other intervening factors unconsidered in our study that may have bearing on the trajectories and recovery effects observed. Any one study can only consider a selection of variables, and ours was chosen to provide both a nuanced and impactful yet parsimonious and interpretable perspective on modeling well-being during the COVID-19 pandemic. That said, other factors such as occupational characteristics and individual differences bear exploration. Still, our results provide insight into the direction and dynamics of well-being during discrete, large-scale events (ie, pandemic lockdowns), bringing to light some of the complexities of fatigue phenomena otherwise uncaptured and unspecified in theory and cross-sectional empirical work.

To this point, conducting more empirical work that directly expands our knowledge of policy implications is of particular importance as well. On the basis of this study, it seems that (un)employment provisions and mitigation systems like Kurzarbeit can reduce individuals' fatigue, but only temporarily. Individuals with Kurzarbeit in this study demonstrated higher levels of fatigue at the outset than did those without, which suggests that the nature of work roles and occupations (eg, differential reactivity and exposures in certain jobs) may play an important role in this intervention's benefits. This is not to say that these programs are of limited utility; rather, they have utility for specific targets and likely could be modified to be useful for additional groups as well. As such, we need more work focusing on time and

place, on the "when" and "where" of change and stability, to engage in preparatory and preventive practice before future crises.

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