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Leadership at the Extreme: A Longitudinal Study of Transformational Leadership Style and Well-Being in Firefighters

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Abstract: This study sought to examine how operational demands hinder individual well-being in firefighters, and also the extent to which fire chiefs' transformational leadership style acts as an operational resource to attenuate this relationship. A total of 115 firefighters participated in the study and completed surveys over seven consecutive days. The results suggest that individuals' well-being trajectories are not influenced by operational demands while individuals' well-being is enhanced over time by team leaders' transformational leadership. The implications of these findings are discussed and future research directions are advanced.

Keywords: transformational leadership; work engagement; emotional exhaustion; high reliability organizations; firefighters

Citation: Marques-Quinteiro, P.; Chambel, M.J.; Maio, A. Leadership at the Extreme: A Longitudinal Study of Transformational Leadership Style and Well-Being in Firefighters. *Fire* **2022**, *5*, 192. https://doi.org/10.3390/fire5060192

Academic Editor: Grant Williamson

Received: 13 September 2022
Accepted: 11 November 2022
Published: 15 November 2022

1. Introduction

Fire events are extreme events that can have an intolerable impact on life, land and property [1]. In recent years, their violence and magnitude have increased at an alarming rate [2]. While society relies on firefighters to deal with fire events, these professionals are subject to diverse operational demands during fire operations that threaten their well-being [1,3]. Examples of such demands include both task-related demands, such as increased coordination efforts, and those of a relational nature, such as decreased morale [4].

According to the job demands–resources (JD-R) model [5], well-being is a two-dimensional construct including work engagement (i.e., a motivational construct characterized by a positive feeling in relation to work) and emotional exhaustion (i.e., a dimension of burnout associated with a prolonged response to stressors in the workplace). The JD-R model also proposes job demands and job resources as antecedents of well-being [5]. While job demands are contextual elements that force individuals to exert continued physical and/or psychological effort for prolonged periods, job resources are instrumental in enabling individuals to attain work goals and cope with job demands [5].

As far as firefighters are concerned, the known job demands include experiencing extreme heat [6], conflict [7], and work-related events that surpass their ability to respond effectively [8]. In the current study, the occurrence of fire events is proposed as an operational demand that will cause the depletion of mental and physical resources, thus leading to the firefighters' decreased well-being. A fire event is the most demanding activity for firefighters, during which they are subject to considerable psychological and physical pressure [6]. During such an event, firefighters often experience a high workload resulting from increased task demands, namely coordination with others, rough terrain and high temperatures, combined with acute stress levels that are triggered by the extreme situations

in which they are performing [9]. Hence, the occurrence of fire events over time is expected to be an operational demand since these events represent a threat to firefighters' physical safety and require sustained effort to be contained and suppressed. The extent to which fire events continue to occur over time causes strain which, when prolonged, will induce an emotionally exhausted state in firefighters [8]. Hence, the following hypothesis was formulated:

Hypothesis 1. *The occurrence of fire events is positively related to emotional exhaustion (Hypothesis 1a), and negatively related to work engagement (Hypothesis 1b) over time.*

The JD-R model [5] also suggests that job demands have a less negative influence on well-being when individuals have the psychological resources to perform [5]. In the firefighting literature, leadership is often regarded as a key element in building firefighters' firefighting capacity since it is highly correlated with performance [9] and safety [10]. Surprisingly, and in the firefighting literature, few empirical studies have established a relationship between fire chiefs' leadership styles and behaviors and critical variables, such as firefighters' well-being [11]. In line with previous research, one established leadership theory that can provide valuable insight into the relationship between leadership and firefighters' well-being in fire events is the transformational leadership theory [12]. Although there is evidence of a relationship between transformational leadership and well-being [13], these findings are not related to the firefighting context, and therefore, context specific research is necessary to establish an empirical link.

Transformational leaders are expected to promote the development of firefighters' self-efficacy beliefs regarding their ability to face the most demanding situations with enthusiasm and dedication [14]. This feature of their role should function as a job resource to help firefighters deal with the challenges of their occupation and act as a protective mechanism for well-being [15]. Furthermore, fire chiefs with a transformational leadership style are more likely to lead in a way that will help firefighters deal with the physical (e.g., tiredness; pain; discomfort) and psychological (e.g., stress; fear; anxiety) challenges that may emerge during fire events [13,14]. This may occur because of transformational leadership behaviors being geared towards achieving higher-order goals under challenging conditions by communicating purpose and enhancing followers' willingness to transcend their self-interest for the benefit of their organization [10]. Transformational leaders are also known to develop trusting relationships with their followers by creating an open, psychologically safe climate where communication can flow bi-directionally, and feedback is abundant. Additionally, the leader uses inspirational motivation and/or individualized consideration to help members believe in their skills and abilities. In line with previous research [9,11], the following hypothesis was formulated:

Hypothesis 2. *The occurrence of fire events is negatively related to firefighters' well-being, to the extent that emotional exhaustion increases more with more fire events over time when transformational leadership is low than when transformational leadership is high (Hypothesis 2a); and that work engagement decreases more with more fire events over time when transformational leadership is low than when transformational leadership is high (Hypothesis 2b).*

A longitudinal methodology was adopted to test these hypotheses to study the role of fire events (as an operational demand) and fire chiefs' transformational leadership style (as an operational resource) in explaining how firefighters' well-being changed over seven consecutive days during the 2020 fire season. Thus, this study goes beyond the accomplishments of previous research as it considers the role of the fire operations' task conditions in the health impairment process associated with daily changes in firefighters' well-being. First, the longitudinal approach adopted in this study helps to clarify the temporal relationship between fire events and firefighters' well-being. Second, although transformational leadership has been highlighted as a job resource in high reliability organizational contexts [9], the integration of the leaders' characteristics with the fire operations'

task conditions to explain when firefighters' well-being increases, or decreases, is innovative and has significant theoretical and practical implications in terms of expanding the JD-R model to include the transformational leadership theory. Finally, the transformational leadership of leaders can be developed through training [10]; thus, the findings of this study may also inform the extent to which developing fire chiefs' transformational leadership is a valuable strategy to enhance firefighters' well-being during fire operations. Figure 1 summarizes the hypothesized research model.

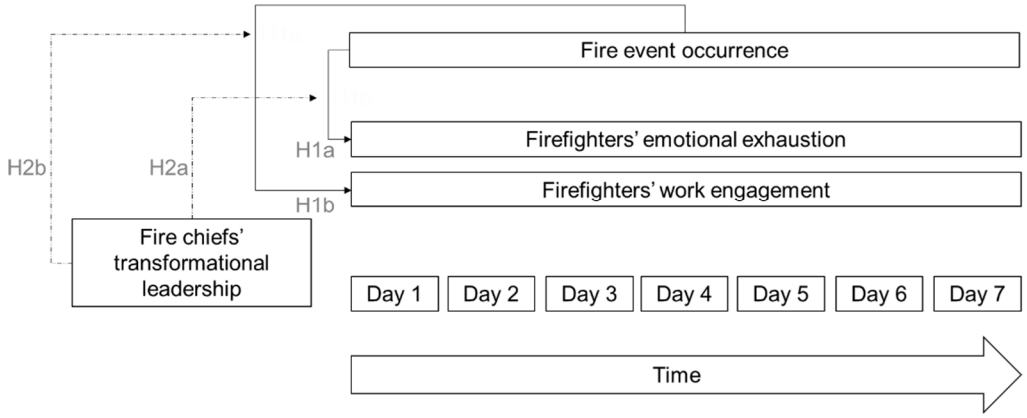

Figure 1. Summary of the research model. Fire chiefs' transformational leadership is regarded as a moderator in the influence of the occurrence of fire events on the firefighters' well-being (work engagement and emotional exhaustion) over the course of a full week (7 days).

2. Materials and Methods

2.1. Procedure

With the collaboration of the Portuguese National Fire School, the support of the Commanders of each Fire Department across the country was requested via e-mail to invite their firefighters to enroll in the study. For those interested in participating, an online session was held to further present the study's procedure and objectives, to clarify any doubts and to collect their signed informed consents.

The data were collected for one week, between July and August 2020 (the months during which fire events are more frequent and violent in Portugal [3]) by means of online surveys disseminated through the SurveyMonkey platform. The firefighters were first asked to rate their fire chief's transformational attributes. A day later, they were invited to engage in daily self-reports of work engagement, emotional exhaustion and operational demands over 7 days. Participation in the study was voluntary and anonymous. The match between the questionnaires of the same firefighter was established with a secret code as an anonymous identifier.

2.2. Sample

The study sample consisted of 115 firefighters, 18 of whom were members of combat teams (ECIN), 74 of permanent intervention teams (EIP) and 23 of the special civil protection force (FEPC). The average age of the participants was 38.53 (SD = 7.47) years and most (83.5%) were male. All the respondents had at least 2 years of professional experience as a firefighter. Finally, most of the respondents worked 40 h a week, 13.5% worked 36 h or less per week, while 20.2% worked between 48 and 50 h per week.

2.3. Materials

Transformational leadership. The fire chiefs' transformational leadership was measured by asking the participants to complete the Multifactor Leadership Questionnaire (MLQ) [16]. The questionnaire captures the 5 dimensions of transformational leadership (four items per dimension): Idealized influence (attributes) (Cronbach $\alpha = 0.80$) (e.g., "My supervisor conveys a sense of power and confidence"); Idealized influence (behaviors)

(Cronbach α = 0.76) (e.g., "My supervisor speaks about his/her most important values and beliefs"); Inspirational motivation (Cronbach α = 0.88) (e.g., "My supervisor speaks so optimistically about the future"); Intellectual stimulation (Cronbach α = 0.79) (e.g., "My supervisor suggests new ways to perform the tasks"); and Individualized consideration (Cronbach α = 0.80) (e.g., "My supervisor believes that each worker has different needs, skills and aspirations"). Responses were given on a 5-point Likert-type scale, ranging from 1 "Never" to 5 "Always".

Work engagement. The participants were asked to report how often they felt engaged during the day, over 7 days, using the Utrecht Work Engagement Scale [17]. Responses were given on a 7-point Likert-type scale, ranging from 1 "Never" to 7 "Always". One example item is "I find the work that I do full of meaning and purpose". The items had good reliability over all 7 days, yielding reliability (Cronbach α) between 0.92 and 0.96.

Emotional exhaustion. Participants were asked to report how often they felt emotionally exhausted during the day, over 7 days, using the 5 items of the exhaustion dimension of the Maslach Burnout Inventory–general version [18]. Responses were given on a 7-point Likert-type scale, ranging from 1 "Never" to 7 "Always". One example item is "Today, working all day was really a strain for me". The items had good reliability over all 7 days, yielding reliability (Cronbach α) between 0.89 and 0.95 (see Table 1).

Table 1. Fire Event Occurrence Predicting Change in Work Engagement.

Variable	Coefficient	SE	*t*
Level 1 effects			
Intercept	0.06	0.09	0.69
Linear trend	0.01	0.01	0.61
Level 2 effects			
Fire events	−0.07	0.05	−1.38
Shift duration	−0.04	0.05	−0.74
Linear trend * Fire events	−0.002	0.01	0.20
Log-likelihood	−567.389	-	-
AIC	1152.78	-	-
BIC	1191.27	-	-

Note. * $p < 0.05$. SE = standard error. AIC = Akaike's information criterion. BIC = Bayesian information criterion.

Fire event occurrence. Participants were asked to report if they had been assigned to a fire event. Participants' responses were coded as 1 (yes) and 2 (no).

Control variables. The duration of work shifts has been previously linked to firefighters' well-being [4]. Therefore, this variable was regarded as a control variable in our model.

3. Results

Since a longitudinal data collection approach was adopted, repeated measures correlations and random coefficient modelling (RCM) were used in this study. The correlation between constructs was tested using the R package "rmcorr" for repeated measures correlations [19]. Repeated measures correlations account for non-independence among observations using an analysis of covariance (ANCOVA) to statistically adjust for inter-individual variability and can easily accommodate missing data. By removing the measured variance between participants, "rmcorr" provides the best linear fit for each participant using parallel regression lines (the same slope) with varying intercepts [19].

To examine the temporal trajectories of the firefighters' work engagement and emotional exhaustion and test the research hypotheses, the analytical recommendations of Bliese and Ployhart [20] were followed and RCM was adopted. The data analysis was performed in the open-source statistical software R (R Core Team, 2017), using the linear and nlme models' package [16]. Based on Bliese and Ployhart [20], Level 1 (within firefighters) effects were tested by using time-related variables to predict changes in the

outcome variables (i.e., daily changes in work engagement and emotional exhaustion were examined by using time as a predictor). In Level 2 (between firefighters), the predictors and control variable of daily changes were included in the outcome variables: fire events, transformational leadership and shift duration. Time was coded as 0, 1, 2, 3, 4, 5 and 6 to represent the seven days of data collection. By coding time in this manner, it was possible to interpret the intercept of the work engagement and emotional exhaustion growths as the scores obtained from participants in the first data collection wave [21].

Table 2 reports the descriptive statistics for the research variables. The outcomes of the repeated measures correlations suggest that participants' work engagement and emotional exhaustion were negatively correlated over time, r = −0.17, $p < 0.001$. There was no statistically significant correlation between work engagement, emotional exhaustion, shift duration, fire events and transformational leadership dimensions.

Table 2. Provides the Descriptive Statistics for the Research Variables.

Descriptive Statistics for the Research Variables							
	Mean (Standard Deviation)						
	Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**	**Day 6**	**Day 7**
Shift duration	11.83 (5.86)	11.73 (5.91)	11.79 (5.93)	11.57 (5.34)	11.97 (5.91)	12.09 (5.92)	11.83 (5.85)
Idealized influence (attributes)	3.66 (0.85)	-	-	-	-	-	-
Idealized influence (behaviors)	3.53 (0.82)	-	-	-	-	-	-
Inspirational motivation	3.70 (0.89)	-	-	-	-	-	-
Intellectual stimulation	3.59 (0.79)	-	-	-	-	-	-
Individualized consideration	3.47 (0.91)	-	-	-	-	-	-
Work engagement	5.33 (1.19)	5.09 (1.13)	5.27 (1.16)	5.28 (1.27)	5.37 (1.15)	5.23 (1.18)	5.33 (1.19)
Emotional exhaustion	2.26 (1.34)	2.45 (1.41)	2.28 (1.28)	2.29 (1.40)	2.34 (1.22)	2.30 (1.26)	2.26 (1.34)
				Frequency			
Fire events–Happened	28	31	31	33	31	31	28
Fire events–Not happened	87	84	84	82	84	84	87

To test the research hypotheses, RCM was used. First, the intraclass correlation (ICC) for work engagement and emotional exhaustion was estimated. The results show that the ICC for work engagement was 0.68, and for emotional exhaustion 0.61. These values are of sufficient magnitude to assume non-independence and to test a random intercept model with our data [20,21].

Second, a fixed intercept model was tested with a linear and quadratic function for time. Regarding work engagement and emotional exhaustion, the results highlight that the estimate of the linear and quadratic functions for time were non-significant, $p > 0.05$. It was then determined whether there was significant variance between the firefighters in the intercept and slope of work engagement and emotional exhaustion over time. Our findings suggest that the linear model is adequate to describe the differences in firefighters' work engagement, $\gamma = 0.02$, $t = 2.17$, $p = 0.03$, and emotional exhaustion, $\gamma = -0.03$, $t = -2.26$, $p = 0.02$, over a period of seven days.

Tests were also run for autocorrelation and heteroscedasticity in the error structure for both constructs. Regarding work engagement, the results suggested that the models controlling for autocorrelation, $\Delta 2LL = 1.38$, $p = 0.24$, and heteroscedasticity, $\Delta 2LL = 0.00000014$, $p = 0.99$, did not improve the model fit. Therefore, we did not control for autocorrelation and heteroscedasticity in the further analyses including work engagement. As regards emotional exhaustion, the results suggested that the model controlling for autocorrelation, $\Delta 2LL = 7.52$, $p = 0.001$, improved the model fit, whereas the model controlling for heteroscedasticity did not, $\Delta 2LL = 3.19$, $p = 0.99$. Therefore, we controlled for autocorrelation in the further analyses including emotional exhaustion.

Finally, in Level 2, models including average values of fire event occurrence over 7 days (Hypothesis 1), and transformational leadership prior to the first day of data collection (Hypothesis 2) were estimated. Regarding Hypothesis 1, the results suggested that the occurrence of fire events did not explain changes in firefighters' work engagement, $\gamma = -0.002$, $t = -0.20$, $p > 0.05$, and emotional exhaustion, $\gamma = -0.004$, $t = -0.34$, $p > 0.05$, over time. These findings do not support Hypotheses 1a and 1b (see Tables 2 and 3; see Figure 2).

Table 3. Fire Event's Occurrence Predicting Change in Emotional Exhaustion.

Variable	Coefficient	SE	*t*
Level 1 effects			
Intercept	0.15	0.09	1.72
Linear trend	−0.04 **	0.02	−2.72
Level 2 effects			
Fire events	−0.02	0.06	−0.37
Shift duration	0.21 ***	0.06	3.71
Linear trend * Fire events	−0.004	0.01	−0.34
Log-likelihood	−610.396	-	-
AIC	1240.793	-	-
BIC	1283.559	-	-

Note. * $p < 0.05$, ** $p < 0.01$. *** $p < 0.001$. SE = standard error. AIC = Akaike's information criterion. BIC = Bayesian information criterion.

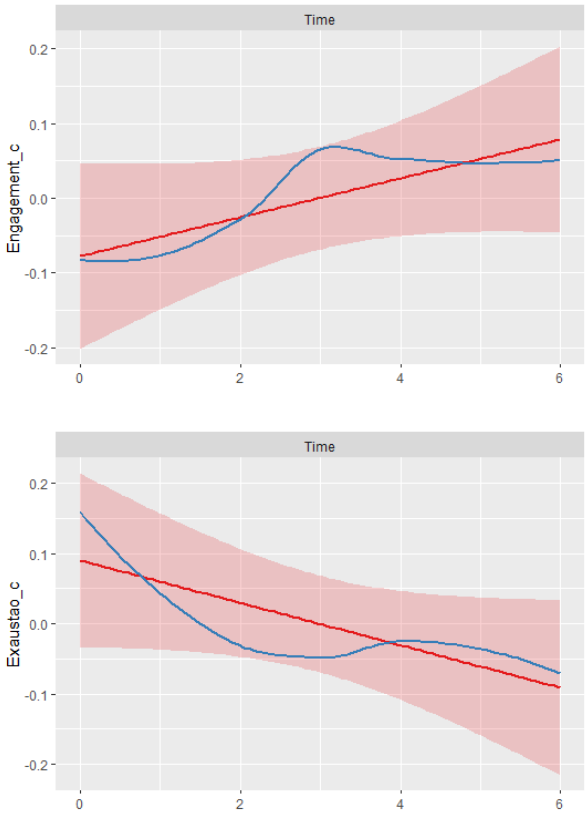

Figure 2. Graph lines for daily fluctuations (blue) and mean levels (red) of firefighters' work engagement (**upper graph**) and emotional exhaustion (**lower graph**) over seven days.

Regarding hypothesis 2a, the research findings also suggested that idealized influence (attributes), $\gamma = 0.18$, $t = 2.20$, $p = 0.03$, idealized influence (behaviors), $\gamma = 0.25$, $t = 3.06$, $p = 0.002$, inspirational motivation, $\gamma = 0.22$, $t = 2.65$, $p = 0.009$, and individualized consideration, $\gamma = 0.16$, $t = 2.12$, $p = 0.035$, were positively related to the firefighters' mean

level of work engagement over seven days (Tables A1–A5 in Appendix A). Regarding Hypothesis 2b, the research findings suggested that leader attributed idealized influence was significantly related to overall work engagement, $\gamma = 0.19$, $t(114) = 2.37$, $p = 0.019$, but non-significantly related to change in work engagement, $\gamma = 0.001$, $t(692) = 0.47$, $p = 0.642$ (Tables A6–A10 in Appendix A). These results do not support Hypotheses 2a and 2b.

4. Discussion

The findings of this study suggest that the occurrence of fire events alone does not influence firefighters' daily changes in well-being. Despite this, our findings also suggest that transformational leadership dimensions are not moderators of the influence between occurrence of fire events and firefighters' well-being, they are positively related with firefighters' mean level of work engagement and emotional exhaustion over time. Moreover, results point to the importance of shift duration as an important antecedent of emotional exhaustion for firefighters, with longer shifts exacerbating the decrease of firefighters' well-being [22].

The fact that the occurrence of fire events was unrelated to change in well-being over one week might be attributed to the small number of fire events reported by the study participants, compared to the number of non-events. This is something worth considering in future studies since event features such as severity, or characteristics of the task's environment such as perceived extremeness, might be more important than the mere occurrence of fire events [1,23]. In addition, professionals who work under extreme conditions tend to make less negative or pessimist appraisals of the dangerous situations in which they are embedded [1,3], and therefore the occurrence of events alone might not be enough to trigger any significant changes in their well-being. However, to the best of our knowledge, this remains unaddressed in the literature and therefore constitutes an opportunity for future studies.

The findings of this study are in line with the JD-R model [5] and the transformational leadership theory [24] since they suggest that operational resources, such as fire chiefs' transformational leadership style, can contribute to increasing work engagement and mitigating emotional exhaustion over time. This means that a fire chief who is regarded by followers as more transformational will increase firefighters' capacity to deal with job demands. This will occur to such an extent that a loss of resources will become less likely or severe, as strain and exhaustion during fire operations will be reduced. Moreover, transformational fire chiefs will foster an increase in the available resources (e.g., skills, emotions and positive feelings) of firefighters, and consequently their work engagement.

Despite its contributions, this study also contains several limitations. One limitation is the fact that it focuses solely on the occurrence of fire events, hence disregarding the accumulation with other events (e.g., road accident extrication and search and rescue operations), the characteristics of the fire events themselves (e.g., duration and intensity), the temporal dynamics between fire events, the objective and subjective workload associated with the events, and, consequently, fluctuations in emotional exhaustion and work engagement; since one week might be a restrictive timeline to study these phenomenon [23,24]. Another limitation is that the transformational leadership was collected on one single occasion and therefore it was only possible to access firefighters' perceptions of their fire chiefs' average behaviors that denoted a transformational leadership style. While this can provide an acceptable level of confidence in so far as fire chiefs behave in a certain way, but it does not offer more precise, day-to-day evidence of the transformational leadership behaviors in which fire chiefs engage [24]. Still on leadership, alternatives to transformational leadership abound. One example includes the functional leadership theory [25], which focuses more on the task and relational aspects of the job than on the motivation of followers (as in transformational leadership). While transformational leadership may be fruitful in the face of fire operations (as our data suggests), during fire operations firefighters might benefit greatly from leadership behaviors that focus on the task itself, as well as the relationships among all those involved in the fire suppression and containment effort [26]. Finally, the

fact that data collection in our study was restricted to a single data collection per day over 7 days, may have limited the extent to which more fine-grained dynamics could have been observed. Therefore, future studies might consider the adoption of a diary study approach to study the relationship between fire event occurrence, transformational leadership and well-being [24].

The findings of this study matter for firefighting scholarship and practice, thus reinforcing transformational leadership as an important tool for the well-being of firefighters. It is the transformational leadership of the managers and team leaders that enables higher (and healthier) levels of well-being. Therefore, transformational leadership should be taken into consideration when recruiting, selecting, and training future fire chiefs [27]. The firefighting community should be made aware of the importance of their engagement in transformational leadership behaviors during fire operations to promote work engagement and mitigate emotional exhaustion in firefighters. Finally, the findings of this study are also relevant for other professional occupations within the High Reliability Organizations literature [3], including air-traffic control and nuclear power plants.

Author Contributions: Conceptualization, M.J.C., P.M.-Q., M.J.C. and A.M.; formal analysis, P.M.-Q. and A.M.; writing—original draft preparation, P.M.-Q.; writing—review and editing, all; project administration, M.J.C.; funding acquisition, M.J.C. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by a research contract from the Fundação para a Ciência e a Tecnologia (ref. PCIF/SSO/0054/2018).

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Comissão de Ética e Deontologia da FPUL, Ref[a] RAPI_2021428mjc, of 20 May 2021, minutes no. 9.

Informed Consent Statement: Informed consent was obtained from all the subjects involved in the study.

Data Availability Statement: The data used in this study are available upon request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Appendix A

This appendix contains the detailed tables on the findings reported in the Results section.

Table A1. Fire Events and Idealized Influence (Behaviors) Predicting Change in Work Engagement.

Variable	Coefficient	SE	*t*
Level 1 effects			
Intercept	0.06	0.08	0.80
Linear trend	0.01	0.01	0.61
Level 2 effects			
Fire events	−0.06	0.05	−1.12
Idealized influence (*behaviors*)	0.24 **	0.08	3.06
Shift duration	−0.04	0.05	−0.71
Linear trend × Fire events	0.001	0.01	0.05
Linear trend × Idealized influence (*behaviors*)	0.002	0.01	0.15
Fire events × Idealized influence (*behaviors*)	0.03	0.06	0.58
Linear trend × Fire events × Idealized influence (*behaviors*)	−0.002	0.01	−0.16
Log-likelihood	−572.39	-	-
AIC	1170.785	-	-
BIC	1226.283	-	-

Note. ** $p < 0.01$. SE = standard error. AIC = Akaike's information criterion. BIC = Bayesian information criterion.

Table A2. Fire Events and Idealized Influence (Attributes) Predicting Change in Work Engagement.

Variable	Coefficient	SE	*t*
Level 1 effects			
Intercept	0.06	0.08	0.76
Linear trend	0.01	0.01	0.66
Level 2 effects			
Fire events	−0.07	0.05	−1.29
Idealized influence (*attributes*)	0.18 *	0.08	2.21
Shift duration	−0.04	0.05	−0.71
Linear trend × Fire events	0.001	0.01	0.13
Linear trend × Idealized influence (*attributes*)	0.01	0.01	0.46
Fire events × Idealized influence (*attributes*)	0.03	0.06	0.49
Linear trend × Fire events × Idealized influence (*attributes*)	−0.01	0.02	−0.43
Log-likelihood	−574.469	-	-
AIC	1174.937	-	-
BIC	1230.436	-	-

Note. * $p < 0.05$. SE = standard error. AIC = Akaike's information criterion. BIC = Bayesian information criterion.

Table A3. Fire Events and Inspirational Motivation Predicting Change in Work Engagement.

Variable	Coefficient	SE	*t*
Level 1 effects			
Intercept	0.06	0.08	0.73
Linear trend	0.01	0.01	0.65
Level 2 effects			
Fire events	−0.07	0.05	−1.31
Inspirational motivation	0.22 **	0.08	2.65
Shift duration	−0.04	0.05	−0.72
Linear trend × Fire events	0.002	0.01	0.13
Linear trend × Inspirational motivation	0.01	0.02	0.34
Fire events × Inspirational motivation	0.04	0.06	0.66
Linear trend × Fire events × Inspirational motivation	−0.01	0.02	−0.39
Log-likelihood	−573.062	-	-
AIC	1172.123	-	-
BIC	1227.621	-	-

Note. ** $p < 0.01$. SE = standard error. AIC = Akaike's information criterion. BIC = Bayesian information criterion.

Table A4. Fire Events and Individualized Consideration Predicting Change in Work Engagement.

Variable	Coefficient	SE	*t*
Level 1 effects			
Intercept	0.06	0.08	0.67
Linear trend	−0.07	0.05	−1.35
Level 2 effects			
Fire events	−0.07	0.05	−1.34
Individualized consideration	0.16 *	0.08	2.11
Shift duration	−0.04	0.05	−0.71
Linear trend × Fire events	0.003	0.01	0.22
Linear trend × Individualized consideration	0.01	0.01	0.85
Fire events × Individualized consideration	−0.03	0.06	−0.58
Linear trend × Fire events × Individualized consideration	0.001	0.01	0.04
Log-likelihood	−574.246	-	-
AIC	1174.492	-	-
BIC	1229.99	-	-

Note. * $p < 0.05$. SE = standard error. AIC = Akaike's information criterion. BIC = Bayesian information criterion.

Table A5. Fire Events and Intellectual Stimulation Predicting Change in Work Engagement.

Variable	Coefficient	SE	*t*
Level 1 effects			
Intercept	0.06	0.08	0.75
Linear trend	0.01	0.01	0.63
Level 2 effects			
Fire events	−0.07	0.05	−1.31
Intellectual stimulation	0.15	0.09	1.74
Shift duration	−0.03	0.05	−0.65
Linear trend × Fire events	0.002	0.01	0.12
Linear trend × Intellectual stimulation	0.01	0.01	0.81
Fire events × Intellectual stimulation	−0.02	0.06	−0.28
Linear trend × Fire events × Intellectual stimulation	0.0001	0.02	0.01
Log-likelihood	−575.217	-	-
AIC	1176.433	-	-
BIC	1231.931	-	-

Note. SE = standard error. AIC = Akaike's information criterion. BIC = Bayesian information criterion.

Table A6. Fire Events and Idealized Influence (Behaviors) Predicting Change in Emotional Exhaustion.

Variable	Coefficient	SE	*t*
Level 1 effects			
Intercept	0.15	0.09	1.72
Linear trend	−0.04 **	0.02	−2.69
Level 2 effects			
Fire events	−0.02	0.06	−0.48
Idealized influence (*behaviors*)	−0.18 *	0.09	−2.03
Shift duration	0.20 ***	0.06	3.63
Linear trend × Fire events	−0.004	0.01	−0.31
Linear trend × Idealized influence (*behaviors*)	−0.01	0.02	−0.41
Fire events × Idealized influence (*behaviors*)	0.02	0.07	0.33
Linear trend × Fire events × Idealized influence (*behaviors*)	−0.01	0.02	−0.34
Log-likelihood	−617.602	-	-
AIC	1322.972	-	-
BIC	1263.204	-	-

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. SE = standard error. AIC = Akaike's information criterion. BIC = Bayesian information criterion.

Table A7. Fire Events and Idealized Influence (Attributes) Predicting Change in Emotional Exhaustion.

Variable	Coefficient	SE	*t*
Level 1 effects			
Intercept	0.15	0.09	1.68
Linear trend	−0.04 **	0.02	−2.75
Level 2 effects			
Fire events	−0.02	0.06	−0.38
Idealized influence (*attributes*)	−0.15	0.09	−1.74
Shift duration	0.20 ***	0.06	3.68
Linear trend × Fire events	−0.003	0.01	−0.27
Linear trend × Idealized influence (*attributes*)	−0.02	0.02	−1.23
Fire events × Idealized influence (*attributes*)	−0.02	0.07	−0.28
Linear trend × Fire events × Idealized influence (*attributes*)	0.02	0.02	1.03
Log-likelihood	−616.738	-	-
AIC	1261.476	-	-
BIC	1321.244	-	-

Note. ** $p < 0.01$, *** $p < 0.001$. SE = standard error. AIC = Akaike's information criterion. BIC = Bayesian information criterion.

Table A8. Fire Events and Inspirational Motivation Predicting Change in Emotional Exhaustion.

Variable	Coefficient	SE	*t*
Level 1 effects			
Intercept	0.15	0.09	1.73
Linear trend	−0.04 **	0.02	−2.72
Level 2 effects			
Fire events	−0.02	0.06	−0.39
Inspirational motivation	−0.17 ††	0.09	−1.89
Shift duration	0.21 ***	0.06	3.71
Linear trend × Fire events	−0.004	0.01	−0.29
Linear trend × Inspirational motivation	−0.02	0.02	−0.96
Fire events × Inspirational motivation	−0.03	0.07	−0.42
Linear trend × Fire events × Inspirational motivation	0.01	0.02	0.35
Log-likelihood	−616.797	-	-
AIC	1261.593	-	-
BIC	1321.36	-	-

Note. †† $p = 0.06$, ** $p < 0.01$, *** $p < 0.001$. SE = standard error. AIC = Akaike's information criterion. BIC = Bayesian information criterion.

Table A9. Fire Events and Individualized Consideration Predicting Change in Emotional Exhaustion.

Variable	Coefficient	SE	*t*
Level 1 effects			
Intercept	0.15	0.09	1.79
Linear trend	−0.04 **	0.02	−2.73
Level 2 effects			
Fire events	−0.02	0.06	−0.37
Individualized consideration	−0.18 *	0.08	−2.22
Shift duration	0.21 ***	0.06	3.72
Linear trend × Fire events	−0.01	0.01	−0.34
Linear trend × Individualized consideration	−0.002	0.02	0.31
Fire events × Individualized consideration	0.02	0.06	0.31
Linear trend × Fire events × Individualized consideration	0.01	0.02	0.63
Log-likelihood	−617.292	-	-
AIC	1262.584	-	-
BIC	1322.351	-	-

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. SE = standard error. AIC = Akaike's information criterion. BIC = Bayesian information criterion.

Table A10. Fire Events and Intellectual Stimulation Predicting Change in Emotional Exhaustion.

Variable	Coefficient	SE	*t*
Level 1 effects			
Intercept	0.14	0.09	1.65
Linear trend	−0.04 **	0.02	−2.63
Level 2 effects			
Fire events	−0.02	0.05	−0.34
Intellectual stimulation	−0.17 †	0.09	−1.92
Shift duration	0.20 ***	0.06	3.89
Linear trend × Fire events	−0.01	0.01	−0.36
Linear trend × Intellectual stimulation	−0.001	0.02	−0.10
Fire events × Intellectual stimulation	0.06	0.07	0.88
Linear trend × Fire events × Intellectual stimulation	−0.01	0.02	−0.72
Log-likelihood	−617.994	-	-
AIC	1263.988	-	-
BIC	1323.755	-	-

Note. † $p = 0.05$, ** $p < 0.01$, *** $p < 0.001$. SE = standard error. AIC = Akaike's information criterion. BIC = Bayesian information criterion.

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