



# Trait Mindfulness Moderates the Association Between Stressor Exposure and Perceived Stress in Law Enforcement Officers

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## Abstract

**Objectives** To test the magnitude of the relationship between self-reported stressor exposure and perceived stress in police officers using a novel measure of daily work events, and whether dispositional mindfulness and resilience moderate this relationship.

**Methods** A total of 114 law enforcement officers from a mid-sized Midwestern US city completed daily logs of job stressors and associated perceived stress, as well as additional self-report measures of perceived stress, trait mindfulness and resilience, and demographics and work information. Principal component analysis (PCA) was used to cluster job stressors into a smaller number of components in a data-driven manner. Linear mixed-effects models were used to test the relationship between stressor exposure and perceived stress for each component, and the moderation of this relationship by trait mindfulness and resilience.

**Results** The PCA categorized stressor exposure into three components: (1) acute or traumatic line-of-duty stressors, (2) routine daily stressors, and (3) interpersonal stressors. Results of mixed models showed robust positive relationships between self-reported stressor exposure and corresponding perceived stress across all 3 components. Dispositional mindfulness (but not resilience) moderated the association between stressor exposure and perceived stress for routine stressors, such that individuals with higher dispositional mindfulness showed a relatively attenuated relationship between exposure to routine daily stressors and resulting perceived stress.

**Conclusions** Police officers high in dispositional mindfulness may experience daily routine stressors as less stressful, which can reduce the accumulation of general stress in the long term and which could help buffer against negative health outcomes associated with perceived stress.

**Trial registration** [Clinicaltrials.gov/ct2/show/NCT03488875](https://clinicaltrials.gov/ct2/show/NCT03488875)

**Keywords** Stressor exposure · Perceived stress · Law enforcement officers · Mindfulness · Resilience

Law enforcement officers (LEOs) are exposed to significant work-related stressors, ranging from routine psychosocial stressors to acute traumatic events, putting this group at elevated risk for stress-related health conditions. For example, a meta-analysis of 60 studies involving over 270,000 police personnel found high rates of depression (14.6%), post-traumatic stress disorder (PTSD; 14.2%), generalized anxiety disorder (9.6%), and suicidal ideation (8.6%), all

of which exceed rates observed in the general population (Syed et al., 2020). Moreover, officers who lack the tools to effectively cope with job stress are more likely to use inappropriate force, express anger, and exercise poor decision-making under pressure, contributing to heightened police-community mistrust (Gershon et al., 2009; Nieuwenhuys et al., 2012; Rajaratnam et al., 2011). Despite elevated rates of negative psychological outcomes in this population, the great majority of police officers do not develop mental health disorders, consistent with evidence that humans are generally quite resilient to traumatic life events (Bonanno, 2004). By investigating how different individuals perceive similar job stressors, and what psychological factors influence this relationship, we can develop a more nuanced understanding of how these stressors “get under the skin” to affect human

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health and well-being and potentially gain insight into interventions that promote more resilient trajectories for the benefit of police officers and the broader community.

A meta-analysis of perceived stress in LEOs, consisting of 338 individual effect size estimates from 103 published and unpublished resources, found quite modest associations between stressor exposure (e.g., operational stressor exposure, past experiences of trauma/illness/injury) and perceived stress (Webster, 2013). Webster (2013) critiqued the frequent binarization of stressors as either operational or organizational in nature and the question of which category “causes” more stress, suggesting that a more nuanced parcellation of stressors may be called for. Webster (2013) also noted that most studies in this meta-analysis assessed either perceived stress or stressor exposure, but not both measures in the same participants, making it difficult to determine the relative contributions of stressor exposure vs. appraisals to negative outcomes.

In addition to alternative categorizations or conceptualizations of work-related stressors, and the concurrent measurement of stressor exposure and perceived stress in the same individuals, greater insight into the relationship between stressor exposure and perceived stress may come from the measurement of these constructs in a field setting, rather than in the laboratory. Daily diary methods offer multiple benefits over laboratory self-report, such as recall bias reduction, measurement in a real-life context, and repeated measurements over the course of multiple days (Bolger et al., 2003). Given the varied events that LEOs are exposed to on a day-to-day basis, daily diaries assessing exposure and appraisals of different stressors may be a valuable complement to established self-report questionnaires. One recent diary study examined stress-related questions among police officers (Van Gelderen et al., 2017), finding that individuals with higher strain at the start of work shifts reported more frequent use of “surface acting” (i.e., faking or suppressing emotions), which in turn contributed to poorer work performance on those days.

A potential explanation for the modest meta-analytic estimates of the association between stressor exposure and perceived stress levels among LEOs (Webster, 2013) is the presence of moderators that this meta-analysis was unable to assess. The trait-like characteristic of resilience, defined as the ability to bounce back quickly from challenging events (Connor & Davidson, 2003), is considered an essential capacity for individuals in high-stress professions to cope with traumatic stressors (McCanlies et al., 2014) and physical injuries (Lyons et al., 2017). A meta-analysis synthesizing 76 effect sizes from 45,188 participants found that trait resilience was associated with lower negative indicators of mental health (i.e., depression, anxiety, general negative affect; Hu et al., 2015). Trait resilience has been shown to moderate the relationship between laboratory-induced pain and perceived stress (Friborg

et al., 2006) and the relationship between perceived stress and anxiety symptoms in an adult community sample during the COVID-19 pandemic (Havnen et al., 2020). These studies suggest that trait resilience may be an important moderator of the relationship between exposure to different types of stressors and perceived stress in LEOs.

Another potential moderator of the relationship between stressor exposure and perceived stress is dispositional mindfulness, as greater awareness of otherwise automatic reactions to stressful events may provide police officers with the opportunity to choose a more adaptive response to these stressors. One study in LEOs found that dispositional mindfulness (measured using the Five Facet Mindfulness Questionnaire-Short Form; Bohlmeijer et al., 2011) moderated the relationship between occupational stressors and perceived stress (Kaplan et al., 2018). More specifically, LEOs low in mindful non-reactivity exhibited a positive relationship between scores on the Operational Police Stress Questionnaire (McCreary & Thompson, 2006) and the Perceived Stress Scale (Cohen & Williamson, 1988), whereas officers high in mindful non-reactivity did not. Notably, the instructions for the Operational Police Stress Questionnaire do not clearly differentiate between exposure and perceived stress, posing a challenge to the interpretation that trait mindfulness fact moderates the exposure–perceived stress relationship. The development and application of an instrument that explicitly differentiates between stressor exposure and perceived stress would allow for a more robust test of the moderating role of trait mindfulness or resilience for stressful events of policing.

In the current study, we developed a novel daily diary-type measure to concurrently assess self-reported exposure and perceived stress for each of 10 different categories of potentially stressful work events associated with policing. We administered this work events log to a sample of 114 Midwestern US law enforcement officers, who completed 4–6 logs during a typical workweek, one at the conclusion of each shift. We conducted principal component analysis of scores for the exposure questions to reduce these 10 categories to 3 orthogonal factors and used these factors to test two hypotheses. First, we hypothesized that variability in daily stress exposure would be positively correlated with perceived stress. Second, we predicted that trait mindfulness and resilience would moderate the association between stress exposure and perceived stress. Additional exploratory analyses tested the impact of demographic and work variables on perceived stress.

## Method

### Participants

The current report utilized baseline data from a randomized controlled trial investigating the effects of an

8-week adapted mindfulness intervention vs. wait-list control in law enforcement officers (<https://clinicaltrials.gov/ct2/show/NCT03488875>). This report reflects preregistered hypotheses on the open science framework (<https://osf.io/jfwrp/>) and additional exploratory analyses. Deviations from our preregistration are indicated in the relevant sections below.

Participants were sworn (non-civilian) employees from three Dane County (WI) law enforcement agencies: the Madison Police Department, the University of Wisconsin–Madison Police Department, and the Dane County Sheriff’s Office. The only exclusionary criteria were previous participation in mindfulness-based stress reduction or similar mindfulness interventions, significant meditation experience, or schedules that precluded class participation. Within each participating agency, recruitment flyers were posted at district stations and recruitment emails were sent to all sworn employees on behalf of the research team (for brevity, we use the phrase “police officers” or “law enforcement officers” to refer to study participants, recognizing that many participants have a rank other than that of “police officer”). For the city police department, the PI also presented information about the study at meetings of the union leadership board and an “Officer Advisory Council” meeting, and at officer briefings during each major shift change over the course of a single week. Interested officers contacted research staff, who conducted a brief phone screening interview and scheduled participants for an in-person assessment.

A total of 115 police officers were enrolled across two cohorts, with 60 and 55 officers enrolled in March 2018 and March 2019, respectively. This sample size was determined by power analyses conducted for the overarching trial. One participant from cohort 2 dropped out following consent and prior to data collection, resulting in a sample size of 114 for analysis (for descriptive statistics on demographic and police work information, see Table 1).

## Procedure

Eligible volunteers were invited to the lab, where they completed written informed consent. During this visit, participants completed a battery of self-report measures described below (for a full list of study measures, see <https://clinicaltrials.gov/ct2/show/NCT03488875>). Toward the conclusion of this visit, participants were provided instructions on when and how to complete daily “work event logs” (see below for details on these logs and details instructions to participants). Results from the larger clinical trial will be presented elsewhere (Grupe et al., under review), and all analyses and results presented below are for baseline data, which were obtained prior to randomization.

## Measures

**Operational Police Stress Questionnaire** (PSQ; McCreary & Thompson, 2006).

The 20-item Operational PSQ assesses perceived stress related to operational stressors of policing (e.g., “risk of being injured on the job,” “working alone at night,” and “feeling like you are always on the job”). The Operational and Organizational PSQ (see next paragraph) were developed and validated among active-duty police officers in Canada (McCreary & Thompson, 2006). Because this measure was to be administered multiple times in the context of an intervention study, we adapted the original measure to ask about stress over the past month rather than the past 6 months. In this sample, the Cronbach’s alpha of the Operational PSQ was  $\alpha = 0.94$ .

**Organizational Police Stress Questionnaire** (PSQ; McCreary & Thompson, 2006).

The 20-item Organizational PSQ assesses perceived stress associated with organizational stressors (e.g., “dealing with coworkers,” “lack of resources,” and “bureaucratic red tape”). As with the Operational PSQ, we adapted the original measure to ask about stress over the past month instead of the past 6 months. The Organizational PSQ alpha was  $\alpha = 0.89$  in this sample.

**Perceived Stress Scale-10** (PSS-10; Cohen & Williamson, 1988).

The PSS-10 is the most widely used assessment of perceived stress and assesses past-month appraisals of general stressors (e.g., “How often have you felt nervous and stressed”) and one’s ability to cope with these stressors (e.g., “How often have you felt that you were on top of things?”; reverse-scored). The PSS-10 demonstrates superior psychometric properties to those of the 14-item PSS and those of the 4-item scale (Lee, 2012). The PSS-10 alpha was  $\alpha = 0.91$  in this sample.

**Brief Resilience Scale** (BRS; Smith et al., 2008).

The 6-item BRS assesses one’s general capacity to bounce back from adversities (example items: “I tend to bounce back quickly after hard times,” “I have a hard time making it through stressful events” (reverse-scored)). In an initial validation study with 4 independent samples, the BRS was shown to have a unitary factor structure and strong convergent and discriminant validity (Smith et al., 2008). In this sample, the BRS alpha was  $\alpha = 0.92$ .

**Five Facet Mindfulness Questionnaire-Short Form** (FFMQ-SF; Bohlmeijer et al., 2011).

The FFMQ-SF is a 24-item scale assessing different facets of trait mindfulness including observing one’s experience (4 items), describing one’s experience (5 items), acting with awareness (5 items), non-judging of inner experiences (5 items), and non-reactivity to inner experiences (5 items). The FFMQ-SF was validated in a sample of adults with

**Table 1** Demographic and work information ( $N=114$ )

	Mean (SD)/ $N$ (%)
Age	40.0 (8.4); range = 23–58
Years of policing	14.1 (8.1); range = 0.1–35.8
Gender	
Male	67 (58.8%)
Female	47 (41.2%)
Race	
White	95 (83.3%)
Black or African American	4 (3.5%)
Asian	3 (2.6%)
Native American or Alaskan Native	2 (1.8%)
More than one race	8 (7.0%)
Unknown	2 (1.8%)
Ethnicity	
Hispanic or Latino	3 (2.6%)
Not Hispanic or Latino	110 (96.5%)
Unknown	1 (0.9%)
Highest level of education	
Some college education	13 (11.4%)
Bachelors/4-year degree	72 (63.2%)
Some postgraduate education	11 (9.6%)
Postgraduate/professional degree	18 (15.8%)
Shift/work detail	
1st detail/days (~ 7:00–15:00)	55 (48.2%)
2nd detail/day “power shift” (~ 12:00–20:00)	8 (7.0%)
3rd detail/evenings (~ 15:00–23:00)	35 (30.7%)
4th detail/night “power shift” (~ 19:00–3:00)	6 (5.3%)
5th detail/nights (~ 23:00–7:00)	10 (8.8%)
Rank/job title	
Police officer	45 (39.5%)
Sheriff’s deputy	30 (26.3%)
Detective	21 (18.4%)
Sergeant	11 (9.7%)
Investigator	3 (2.6%)
Lieutenant	3 (2.6%)
Captain	1 (0.9%)
Agency	
Madison Police Department	64 (56.1%)
Dane County Sheriff’s Office	40 (35.1%)
University of Wisconsin–Madison Police Department	10 (8.8%)

symptoms of depression and anxiety and cross-validated in an independent sample (Bohlmeijer et al., 2011) and has shown changes following an 8-week mindfulness intervention in police officers (Christopher et al., 2016). Both the total score of each facet and a sum of all facets were used for analyses.

Due to an error in entering questions into our online survey, items 19–24 were missing at baseline for participants in cohort 1. This included one item each from “observing one’s experience” and “non-reactivity,” and two items each

in “acting with awareness” and “non-judgment.” This mistake was identified and corrected before subsequent assessments. Rather than abandoning data from the FFMQ-SF for cohort 1, we imputed missing data for each subscale using the mean score of items collected for that subscale. Independent sample  $t$ -test results indicated that means of the extrapolated subscales for cohort 1 were not different from the corresponding subscales for cohort 2,  $t_s < 0.8$ ,  $p_s > 0.4$ . Owing to the error in administration for cohort 1, we only assessed internal consistency for cohort 2. In the cohort 2

sample ( $n = 54$ ), the FFMQ-SF alphas were  $\alpha = 0.88$  for the total score and ranged between  $\alpha = 0.74$  and  $0.89$  for individual facets.

### Work Events Log

The work events log is a novel measure created for this study to assess self-reported exposure and perceived stress associated with different categories of police work stressors on a daily basis. We created an initial 10-item scale with items largely derived from the Operational and Organizational Police Stress Questionnaire (McCreary & Thompson, 2006), with categories for organizational stressors based on a factor analysis of the Organizational PSQ (Shane, 2010). After modifying the questions and format of this scale based on feedback from collaborators, this log was shared with 10 local officers to improve the content validity and ensure that the wording and instructions were easily interpreted by police officers. We received detailed feedback on the content and wording from 6 of these officers, which resulted in the final version of the work events log used in this study (see Table 2 for individual items and the Supplementary Appendix for the full measure).

Participants were asked to complete the work events log on each day of a “typical” workweek, either in the final few minutes of their shift or soon after finishing the shift. Based on feedback from local officers, we provided participants the option to complete this log on paper or electronically. The log first asks for basic information about one’s work shift (date, day of work rotation, shift start/end time, overtime hours). For each of 10 event categories, participants are asked to reflect on their workday and answer 2 questions: “How much exposure to each of these events did you encounter during today’s work?” (“work events-exposure”) and “How much stress did you experience as a result of this

exposure?” (“work events-perceived stress”). For the exposure question, higher scores indicate more exposure (0 = no exposure/did not experience, 1 = less exposure than a typical day, 2 = about the same exposure as a typical day, 3 = more exposure than a typical day). For the perceived stress question, higher scores indicate greater stress (0 = no stress at all, 10 = extreme amount of stress). An additional item asks participants: “Overall, compared to a typical day at work, my time spent at work today was,” with responses for “much less stressful,” “somewhat less stressful,” “pretty typical,” “somewhat more stressful,” and “much more stressful” converted to a 1–5 scale. Finally, participants could provide open-ended feedback about the events of their workday.

### Demographics and Police Work Information

We collected information on participants’ age, gender, highest education level, race and ethnicity, years of policing, employer/agency, job title and description, and work shift.

### Data Analyses

All statistical analyses were conducted in RStudio (version 1.2.5033; RStudio Team, 2019) in the R programming environment (Version 3.6.3; R Core Team, 2019).

### Principal Component Analysis of Work Events

Principal component analysis (PCA) was conducted to reduce the dimensionality of the 10-item work events log. We conducted PCA on the stressor exposure questions corresponding to the first day on which each participant completed the full log. One participant dropped out of the study prior to data collection, and one participant never returned

**Table 2** Items on the 8-item work events log and factor loadings on each component ( $N = 113$ )

Event category	Component 1: acute/ traumatic stressors	Component 2: routine stressors	Component 3: interpersonal stressors
1. Challenges or frustration with supervisors and leadership	.01	.01	<b>.83</b>
2. Conflict with coworkers	.17	.03	<b>.75</b>
3. <i>Inadequate equipment, or equipment not working as it should</i>	-	-	-
4. Required paperwork and reports (e.g., Tracs, routine reports, follow-up) and other administrative responsibilities	-.04	<b>.69</b>	.08
5. Increased demands stemming from patrol or other staff shortages	.29	<b>.66</b>	.18
6. “Routine” calls for service	.20	<b>.69</b>	-.22
7. Arresting or detaining suspects	<b>.79</b>	.33	.03
8. Responding to traumatic events (e.g., MVA, overdose, domestics, death, or injury)	<b>.70</b>	.14	.14
9. Incidents involving threat of injury or bodily harm to yourself or fellow officers	<b>.83</b>	-.03	.03
10. <i>Negative comments or criticism from members of the public, media, etc.</i>	-	-	-

Results of the final principal component analysis after removing items with double-loading (#10) or loading  $< 0.40$  on all 3 components (#3)

the daily logs, resulting in data from 113 participants for analysis. The PCA was run prior to preregistration.

There are several possible criteria for determining the number of components to retain from PCA. The most common approach is to retain components based on the eigenvalues of the correlation matrix, with the Kaiser–Harris criterion suggesting retention of components with an eigenvalue greater than 1.0 along with a scree plot. In a parallel analysis approach, randomly generated data matrices are populated and components are retained if eigenvalues from real data are larger than those of corresponding simulated data matrices. Faced with a conflict between these two criteria, we chose to retain a larger number of components, allowing us to categorize stressors into more specific/discrete components than just organizational and operational stress (Kabacoff, 2011).

### Zero-order Correlations of Work Events Log Perceived Stress and Alternative Stress Measures

To assess the convergent validity of our novel measure, bivariate correlations were assessed between perceived stress on the work events log and established scales of perceived stress (i.e., Organizational and Operational PSQ, PSS-10). We conducted correlation analyses using the average perceived stress scores for each component and for overall daily stress across all workdays. We expected work events log–perceived stress scores to have medium-to-large correlations with established measures of perceived stress. These correlations were not indicated in our preregistration but are included here for a more complete characterization of the novel work events log.

### Associations Between Daily Stress Exposure and Perceived Stress

Linear mixed-effects models (using the “lmerTest” package in R) were employed to test the relationship between work events-exposure and work events-perceived stress on each PCA-derived component. For each component, we calculated the mean of exposure and perceived stress responses for all items contributing to that component. In contrast to our preregistration, we did not consider the average score of all items from work events log–perceived stress in this analysis, as this average score is both redundant with and offers less specific information than the factor analysis-derived stress scores. We excluded data from participants if they had fewer than 4 days of available data, based on previous studies looking at inter-day variability in sleep patterns (Rowe et al., 2008) and physical activity patterns (Scheers et al., 2012). Cluster-mean centering of exposure scores (centered around each participant’s own mean) was used rather than the raw

exposure scores indicated in our preregistration, as the use of raw scores resulted in model convergence errors. Bell et al. (2018) suggested that cluster-mean centering should be used for multilevel data analyses as it is more informative and allows for better parcellation of within- and between-subject variance than multilevel models using uncentered variables.

We expected a significant effect of exposure on perceived stress, indicating that greater stressor exposure for a given component is associated with greater perceived stress for the same component. Models included fixed effect covariates of “cohort” (whether participants were enrolled in year 1 or year 2 of the study) and “days” (which day of the workweek participants completed the work events log, ranging from day 1 to day 6). Exploratory analyses did not demonstrate a clear linear relationship between days and perceived stress from work events, so “days” was coded as a categorical variable (note that our preregistration indicated in error that a random slope would be modeled for the within-subject effect of days rather than stressor exposure, as intended). Models were represented in R as follows:

```
Model1 = lmer(Perceived Stress ~ mc.Exposure + Days + Cohort
              + (1 + mc.Exposure|Subject))
```

The `eta_sq()` function in the “sjstats” package provided effect size estimates of partial  $\eta^2$ .

### Moderating Effects of Resilience and Mindfulness on Exposure–Stress Relationships

The `lmerTest` R library was used to run linear mixed-effects models for H2. Participants with valid work event logs for at least 4 days were used for analysis. The number of participants for each analysis varied between 103 and 107 due to incomplete work logs for some participants and days. We expected significant exposure\*mindfulness and exposure\*resilience interactions, such that individuals with higher levels of trait mindfulness and resilience would show relatively attenuated relationships between stressor exposure and perceived stress. Total scores of FFMQ-SF and scores of each individual facet were tested separately, and “days” and “cohort” were again included as fixed effect covariates. Models to test H2 were represented in R as follows:

```
Model 2a = lmer(PerceivedStress ~ mc.Exposure * Mindfulness + Days
                + Cohort + (1 + mc.Exposure | Subject))
```

```
Model 2b = lmer(PerceivedStress ~ mc.Exposure * Resilience + Days
                + Cohort + (1 + mc.Exposure | Subject))
```

### Exploratory Analyses

In exploratory analyses, we tested the impact of additional fixed effect covariates of demographics (i.e., gender, age) and policing information (i.e., years of policing, typical work shift, actual work duration for that day, job responsibilities, agency) on perceived stress for each component. All additional covariates were included in the model at the same time. To identify whether perceived stress varied based on broad differences in work responsibilities while allowing for sufficiently powered subgroups, we binarized job responsibilities into officers/deputies with a primary patrol/field assignment vs. all other assignments. This binarization was based on the reasoning that the nature of job stressors varies greatly for patrol officers or field deputies whose work is primarily call-driven assignment vs. other roles that are less responsive or reactive in nature.

## Results

### Principal component analysis of work events

There were 3 components that met the eigenvalue cut-off of 1.0, with eigenvalues of 2.62, 1.40, and 1.16, respectively (Supplementary Fig. 1). Parallel analysis of simulated data showed the first three simulated eigenvalues should be larger than 1.49, 1.34, and 1.22, respectively, suggesting 2 components. We elected to use the 3-component structure to analyze item loading on each component, as one motivating factor of this study was to parse stressors into more specific components instead of overly broad categories. Item 3 (“inadequate equipment, or equipment not working as it should”) had a loading of less than 0.40 on all 3 components and was removed. After item 3 was deleted, item

10 (“negative comments or criticism from members of the public, media, etc.”) double-loaded on 2 components and was removed. The resulting 8 items had loadings > 0.40 on a single component, as shown in Table 2.

The 8-item, 3-component structure was retained for subsequent analyses. The 3 items loading on component 1, which we label “acute/traumatic stressors,” pertained to less frequent yet relatively more intense line-of-duty stressors including arrests, exposure to trauma, and threat of injury or bodily harm. Component 2, which we label “routine stressors,” included 3 items assessing paperwork, staffing shortages, and routine calls for service. Component 3, which we label “interpersonal stressors,” included 2 items assessing challenges and conflicts with leadership or supervisors and with coworkers. Components 1, 2, and 3 explained 24%, 19%, and 17% of total variance, respectively.

### Associations Between Novel Work Events Stress Measure and Alternative Measures of Stress

Descriptive statistics for the work events log (i.e., stress exposure, perceived stress, overall stress), established stress measures (PSS-10, Operational/Organizational PSQ), and hypothesized moderators (FFMQ-SF, BRS) are presented in Supplementary Table 1. The distribution of stressor exposure for the 3 PCA-derived components from the work events log is presented in Supplementary Fig. 2.

Perceived stress for each of the 3 components showed a significant positive correlation with the single-item, overall daily stress question (Table 3). This single-item stress question showed a stronger association with perceived stress of routine stressors ( $r(108) = 0.41$ ) than with perceived stress of acute/traumatic stressors ( $r(108) = 0.26$ ; Williams’ test of dependent correlations  $t(107) = 2.03$ ,  $p = 0.045$ ). The correlation between the single-item stress measure and perceived stress for interpersonal

**Table 3** Bivariate correlations between work events log perceived stress and alternative stress measures ( $N = 110$ )

	1	2	3	4	5	6	7
Perceived stress component 1 <sup>a</sup>	—						
Perceived stress component 2 <sup>b</sup>	.65 <sup>***</sup>	—					
Perceived stress component 3 <sup>c</sup>	.26 <sup>**</sup>	.44 <sup>***</sup>	—				
Work events-daily overall stress (single item)	.26 <sup>**</sup>	.41 <sup>***</sup>	.25 <sup>**</sup>	—			
Operational Police Stress Questionnaire	.29 <sup>**</sup>	.52 <sup>***</sup>	.30 <sup>**</sup>	.23 <sup>*</sup>	—		
Organizational Police Stress Questionnaire	.23 <sup>*</sup>	.49 <sup>***</sup>	.39 <sup>***</sup>	.14	.65 <sup>***</sup>	—	
Perceived Stress Scale	.09	.30 <sup>**</sup>	.20 <sup>*</sup>	.10	.45 <sup>***</sup>	.32 <sup>***</sup>	—

For correlations involving perceived stress scores from the work events log, scores reflect averages across all days that participants completed the log

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

<sup>a</sup>Component 1 assessed perceived stress for acute/traumatic stressors

<sup>b</sup>Component 2 assessed perceived stress for routine stressors

<sup>c</sup>Component 3 assessed perceived stress for interpersonal stressors

stressors ( $r(108)=0.25$ ) did not differ significantly from correlations for perceived stress of routine ( $t(107)=1.73$ ,  $p=0.087$ ) or acute/traumatic stressors ( $t(107)=0.10$ ,  $p=0.92$ ). A qualitatively similar pattern was observed for relationships with each of the established stress measures (Operational PSQ, Organizational PSQ, and PSS). In each case, perceived stress for routine stressors was more robustly correlated with scores on established stress measures than was perceived stress for acute/traumatic stressors ( $ts > 2.7$ ,  $ps < 0.01$ ). Perceived stress for interpersonal stressors showed intermediate correlations with established stress measures than those of routine and acute/traumatic stressors. For the Operational PSQ, perceived stress for interpersonal stressors showed a significantly weaker relationship than perceived stress for routine stressors ( $t(107)=2.56$ ,  $p=0.012$ ); in all other cases, correlations with established stress measures and perceived stress for interpersonal stressors did not differ significantly than those of acute/traumatic or routine stressors ( $ts < 1.8$ ,  $ps > 0.09$ ).

### Associations Between Daily Stress Exposure and Perceived Stress

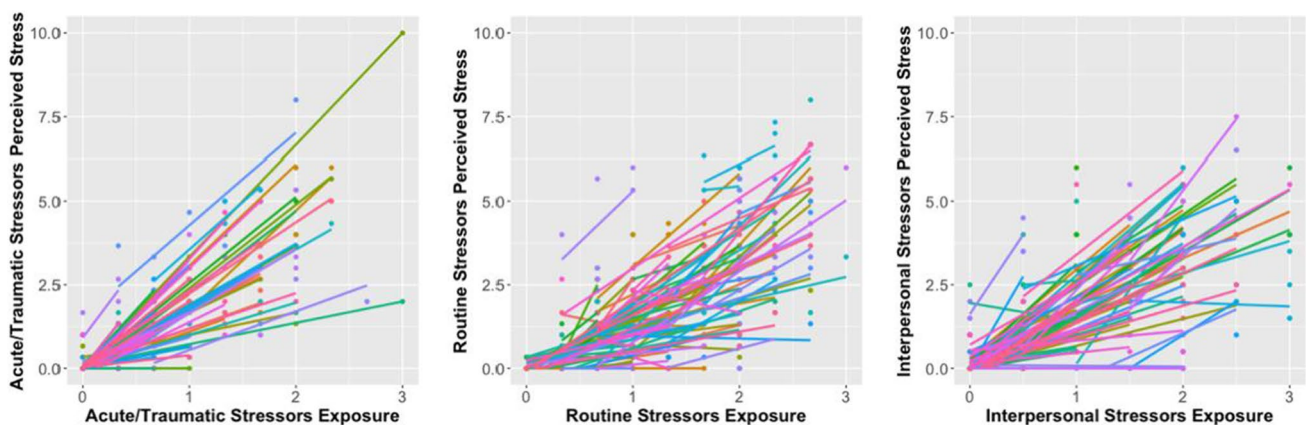
Results of mixed model analyses showed robust positive relationships between daily stress exposure and corresponding perceived stress from the work events log across all 3 components (Fig. 1). For acute/traumatic stressors, a 1-point increase in stress exposure (on a 4-point scale) was associated with a 1.66-point increase in perceived stress (on a 10-point scale), explaining 77% of total variance in perceived stress ( $b=1.66$ ,  $F(1, 75.14)=247.73$ ,  $p<0.001$ , partial  $\eta^2=0.77$ ). Similarly, robust relationships were observed for routine stressors ( $b=1.37$ ,  $F(1, 86.68)=194.43$ ,  $p<0.001$ , partial  $\eta^2=0.69$ ) and

interpersonal stressors ( $b=1.46$ ,  $F(1, 79.77)=216.33$ ,  $p<0.001$ , partial  $\eta^2=0.73$ ). Neither of the covariates (days and cohort) accounted for significant variance in perceived stress for any of the 3 components ( $Fs < 1.81$ ,  $ps > 0.183$ , partial  $\eta^2 < 0.03$ ).

### Trait Mindfulness but not Resilience Moderates the Association Between Daily Stress Exposure and Perceived Stress

Total scores on the FFMQ-SF moderated the association between daily stressor exposure and perceived stress for routine stressors, but not acute/traumatic stressors or interpersonal stressors (Table 4). In other words, higher levels of mindfulness attenuated the association between the more “routine” stressors of policing (e.g., paperwork, staff shortages, routine calls for service) and perceived stress associated with these stressors (Fig. 2), but not associations between exposure to acute/traumatic stressors or interpersonal stressors and resulting perceived stress. A main effect of mindfulness, however, was observed for interpersonal stressors, such that individuals with greater trait mindfulness experienced relatively less stress from interpersonal stressors ( $p=0.027$ ).

Follow-up analyses for the exposure\*mindfulness interaction on perceived stress for routine stressors were conducted for each of the five facets of the FFMQ-SF. These analyses revealed significant interactions for “describing” ( $b=-0.05$ ,  $F(1, 86.05)=4.38$ ,  $p=0.039$ , partial  $\eta^2=0.05$ ) and “acting with awareness” ( $b=-0.06$ ,  $F(1, 97.20)=4.41$ ,  $p=0.038$ , partial  $\eta^2=0.04$ ), but not for “observing” ( $b=0.03$ ,  $F(1, 97.64)=1.02$ ,  $p=0.316$ , partial  $\eta^2=0.01$ ), “non-judgment” ( $b=-0.05$ ,  $F(1, 80.68)=3.84$ ,  $p=0.053$ , partial  $\eta^2=0.05$ ), or “non-reactivity” ( $b=-0.04$ ,  $F(1, 84.91)=2.12$ ,  $p=0.150$ , partial  $\eta^2=0.02$ ). Consistent with results of the FFMQ-SF total score analysis, none of the FFMQ-SF



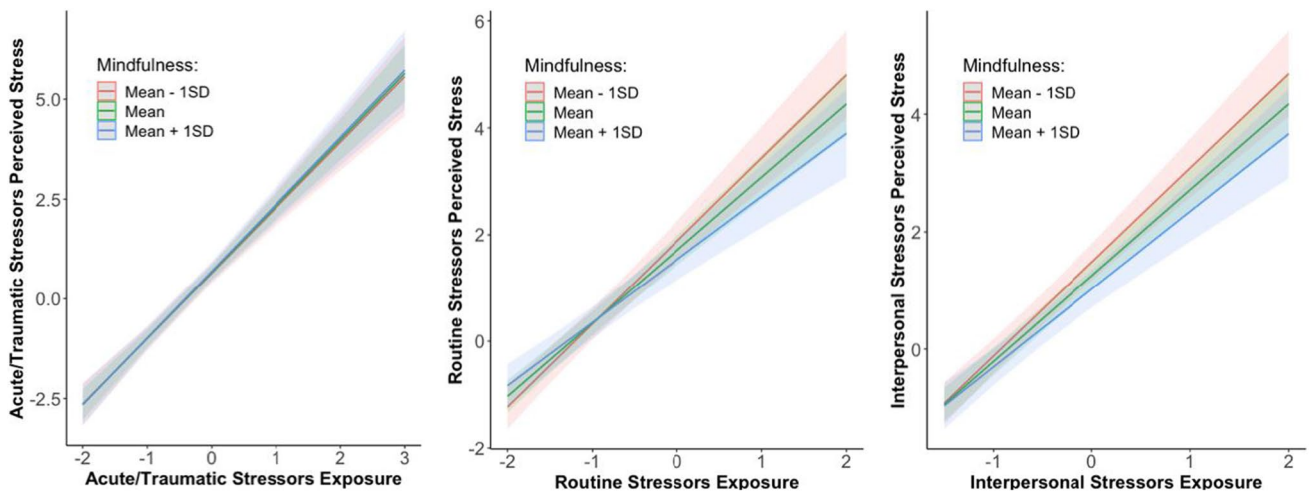
**Fig. 1** Associations between exposure and perceived stress for each component on the work events log. Each line represents the estimated linear relationship between exposure and perceived stress for each participant across 4–6 days



**Table 4** Mixed models to test the moderating effect of mindfulness on the association between stress exposure and perceived stress

Variable	<i>b</i>	<i>SE</i>	<i>F</i>	Error <i>df</i>	<i>p</i>	partial $\eta^2$
Stress component 1						
Exposure component 1 <sup>a</sup>	1.54	0.66	5.44	66.69	.023	.08
Mindfulness	0.002	0.01	0.10	101.37	.756	.001
Days	—	—	0.39	372.28	.853	.01
Cohort	0.15	0.16	0.87	103.59	.354	.01
Exposure component 1 * mindfulness	0.001	0.01	0.03	66.86	.858	.00
Stress component 2						
Exposure component 2	2.54	0.60	18.20	82.79	<.001	.18
Mindfulness	−0.01	0.01	1.75	102.87	.189	.02
Days	—	—	1.22	411.94	.301	.02
Cohort	0.26	0.20	1.73	77.32	.192	.02
Exposure component 2 * mindfulness	−0.02	0.01	4.00	82.62	.049	.05
Stress component 3						
Exposure component 3	2.34	0.61	15.02	78.76	<.001	.16
Mindfulness	−0.02	0.01	5.01	105.20	.027	.05
Days	—	—	1.11	409.70	.357	.01
Cohort	0.17	0.18	0.94	93.04	.334	.01
Exposure component 3 * mindfulness	−0.01	0.01	2.13	80.56	.148	.03

Component 1 assessed acute/traumatic stressors; component 2 assessed routine stressors; component 3 assessed interpersonal stressors <sup>a</sup>Mean-centered scores (within individuals) were used for each exposure component



**Fig. 2** Interaction of routine stressor exposure and mindfulness on perceived stress from the work events log. For acute/traumatic stressors (component 1), there were no effects involving trait mindfulness. For routine stressors (component 2), the significant interaction between mindfulness and exposure reflected relatively attenuated perceived stress with increasing exposure for individuals with higher

levels of trait mindfulness. For interpersonal stressors (component 3), there was a significant main effect of mindfulness, with lower perceived stress for individuals higher in trait mindfulness. Each panel reflects mean-centered exposure scores and predicted values of perceived stress at different levels of trait mindfulness from mixed regression models (see Table 4)

subscales moderated the relationship between stressor exposure and perceived stress for acute/traumatic stressors or interpersonal stressors (all *F*s < 2.19, all *p*s > 0.144).

We repeated the significant interaction test for cohort 2 alone to see whether results would replicate in participants with non-imputed FFMQ-SF data. In this much smaller sample, FFMQ-SF scores did not moderate the association

between daily exposure and perceived stress for routine stressors ( $b = -0.01$ ,  $F(1, 37.73) = 0.24$ ,  $p = 0.630$ , partial  $\eta^2 = 0.01$ ). Furthermore, the main effect of dispositional mindfulness on perceived stress for interpersonal stressors was no longer significant in cohort 2 alone ( $b = -0.01$ ,  $F(1, 55.40) = 1.82$ ,  $p = 0.182$ , partial  $\eta^2 = 0.03$ ). Contrary to hypotheses, trait resilience did not moderate the relationship

between stressor exposure and corresponding perceived stress for any of the 3 work event components (all  $F$ s < 2.65, all  $p$ s > 0.107; [Supplementary Table 2](#)). The main effects of exposure were significant for 3 components (all  $F$ s > 15.88, all  $p$ s < 0.001), while the main effects of resilience were not significant for any components (all  $F$ s < 2.15, all  $p$ s > 0.144).

## Exploratory Analyses

### Impact of Demographic and Job Covariates on Daily Stress

Exploratory analysis of demographic and work covariates revealed higher levels of perceived stress for acute/traumatic stressors for participants working in a primary patrol/field capacity compared to all other assignments ( $b=0.40$ ,  $F(1, 94.12)=6.28$ ,  $p=0.014$ , partial  $\eta^2=0.06$ ; [Supplementary Table 3](#)). Perceived stress for acute/traumatic stressors was unrelated to age, gender, years of policing, work shift, shift duration, or agency ( $F$ s < 3.75,  $p$ s > 0.053, partial  $\eta^2$ s < 0.09). Perceived stress for routine stressors was greater for longer shift durations ( $b=0.001$ ,  $F(1, 419.9)=10.99$ ,  $p<0.001$ , partial  $\eta^2=0.03$ ) and for participants working in a primary patrol/field capacity compared to all other assignments ( $b=0.46$ ,  $F(1, 77.97)=4.64$ ,  $p=0.034$ , partial  $\eta^2=0.06$ ), but not with other covariates ( $F$ s < 1.62,  $p$ s > 0.180, partial  $\eta^2$ s < 0.08; [Supplementary Table 4](#)). Perceived stress for interpersonal stressors was lower for participants working primarily in a patrol/field capacity ( $b=-0.44$ ,  $F(1, 78.21)=5.09$ ,  $p=0.027$ , partial  $\eta^2=0.06$ ), but was unrelated to other covariates ( $F$ s < 1.99,  $p$ s > 0.144, partial  $\eta^2$ s < 0.05; [Supplementary Table 5](#)).

### Results of Constrained Moderating Models after Controlling for Significant Covariates

Participants high in trait mindfulness still showed a relatively attenuated association between stress exposure and perceived stress for routine stressors while controlling for significant covariates (work duration and job responsibilities) identified in exploratory analyses ( $b=-0.01$ ,  $F(1, 82.48)=4.16$ ,  $p=0.045$ ). This interaction remained non-significant for both acute/traumatic stressors and interpersonal stressors after controlling for significant covariates ( $F$ s < 2.26,  $p$ s > 0.134). The interaction between exposure and resilience also remained nonsignificant for all components after controlling for the influence of significant covariates ( $F$ s < 2.82,  $p$ s > 0.097).

## Discussion

A novel daily diary-type measure assessing exposure to 10 different categories of potentially stressful work events and corresponding levels of perceived stress was administered

to a sample of 114 Midwestern US law enforcement officers during a typical workweek. Results of a PCA suggested an underlying 3-component structure measuring (1) acute or traumatic line-of-duty stressors, (2) routine daily stressors, and (3) interpersonal stressors. Perceived stress associated with routine stressors had stronger zero-order correlations with established measures of perceived stress than perceived stress associated with acute/traumatic stressors and interpersonal stressors. Results of mixed models showed robust positive relationships between daily stress exposure and corresponding perceived stress across all 3 components. Finally, dispositional mindfulness moderated this association for routine stressors only, suggesting that higher levels of trait mindfulness allow for a “decoupling” of exposure to routine stressors and resulting perceived stress.

Our results suggest a particularly important role for perceived stress associated with routine stressors in our novel work events log (i.e., paperwork, staffing shortages, routine calls for service). Notably, these items include events that cut across traditionally conceived “organizational” and “operational” stressors in established police stress measures, underscoring the value of our data-driven PCA approach and suggesting that different conceptualizations of stressors may be important for the study of stress in policing. Perceived stress for routine stressors was more strongly correlated with established stress measures (Perceived Stress Scale, Organizational and Operational PSQ) than were ratings of stress associated with acute/traumatic stressors, with stress from interpersonal stressors intermediate between the two. This finding resonates with previous studies demonstrating that routine stressors of policing often have a more deleterious effect on officer well-being and mental health than critical incidents or acute stressors (e.g., Liberman et al., 2002; Maguen et al., 2009). Taken with these previous studies, our results suggest that the accumulation of daily hassles, particularly in a non-supportive organizational environment (Tuckey et al., 2012), may have a deleterious effect on officers’ long-term mental health (Waters & Ussery, 2007). Past research on the impact of routine police stressors has not specified whether it is exposure to or appraisal of these routine stressors that matters most. Our novel measure attempts to differentiate between these two and could thus be used in future research to clarify whether exposure or appraisal matters more for long-term health and well-being.

Crucially, we found that dispositional mindfulness was associated with a relative decoupling of the relationship between stress exposure and perceived stress for these routine stressors. Previous studies using a carefully controlled laboratory stressor, the Trier Social Stress Test, identified less negative appraisals of identical stressors for individuals scoring higher in dispositional mindfulness (Brown et al., 2012) or for long-term meditation practitioners relative to non-meditators (Rosenkranz et al., 2016). The

current results resonate with these previous studies while providing greater ecological validity than these controlled yet somewhat contrived laboratory stressors, suggesting that greater dispositional mindfulness allows for a more adaptive appraisal of routine stressors occurring in one's daily work environment.

Moderation of the exposure–perceived stress relationship by mindfulness was observed for routine stressors but not acute/traumatic stressors or interpersonal stressors. This suggests that individuals higher in mindfulness do not demonstrate a general “blunting” of stress appraisals for all stressors. Dereification or decentering, which contributes to the global construct of “mindfulness,” refers to a shift in one's relationship with thoughts, such that thoughts are not experienced as real objects in the world (Wielgosz et al., 2019). Our results suggest that this tendency may allow police officers to selectively and with discretion change the way they interpret events that need not be appraised as stressful or threatening (routine stressors), but not those that pose an immediate threat to one's safety or physical well-being (acute/traumatic stressors).

Notably, while mindfulness did not moderate the exposure–perceived stress relationship for interpersonal stressors, we did observe a main effect of mindfulness, with individuals higher in mindfulness reporting lower perceived stress irrespective of exposure to interpersonal stressors. Research on stress in policing tends to lump interpersonal stress in with questions about other organizational stressors (the inclusion of items measuring coworker and supervisor relations, however, was based on a previous factor analysis that identified each as a unique factor of the Organizational PSQ; Shane et al., 2010). Our findings (and those of Shane et al., 2010) challenge the validity of this “lumping” approach, suggesting that daily exposure to interpersonal stressors can be differentiated from other “routine” stressors and those trait-like characteristics such as mindfulness may be important for how LEOs appraise stress from interactions with coworkers or supervisors.

Follow-up analysis of the significant mindfulness\*exposure interaction for routine stressors revealed significant relationships for two facets of the FFMQ, “describing” and “acting with awareness.” Day et al. (2017) categorized those two facets as cognitive process domains reflecting how an individual thinks about stressors. Mentalization is a form of social cognition reflecting “imaginative mental activity that enables us to perceive and interpret human behavior in terms of intentional mental states,” and explicit mentalization is a conscious and verbal process requiring explicit awareness, attention, and effort (Fonagy & Luyten, 2009). Explicit mentalization may be an essential capacity for officers dealing with daily stressors, especially in responding to calls for services in a way that allows officers to properly perceive and interpret community members'

needs and to respond professionally and in a manner that is responsive to these needs.

Contrary to our hypotheses, trait resilience did not moderate the association between stress exposure and perceived stress for any components of the work events log. It is possible that participants who self-selected into this study are more resilient or high-functioning than police officers in general, or an unselected population, which may consequently weaken the hypothesized effect of general resilience on the exposure–perceived stress relationship (the mean score for this sample was 3.66, nominally higher than that of a large sample of health professionals (3.50), another human services group exposed to significant stress and trauma (Kemper et al., 2015)). Another possibility is that the use of a general resilience scale, rather than a more domain-specific measure, may have influenced our results. For example, a scale assessing “pain resilience” is a stronger predictor of pain intensity and quality of life than general resilience among participants with chronic pain (Ankawi et al., 2017). Resilience is a complex construct that manifests differently across different individuals, organizations, or cultures (Southwick et al., 2014). Future research might develop a measure to assess “police resilience” in response to specific circumstances (e.g., the routine daily stressors, interpersonal stressors, and acute/traumatic stressors we identified using our work events log) and test whether officers scoring high on this occupationally specific resilience measure report less negative appraisals of various occupational stressors.

## Limitations and Future Research

The current study has several limitations. First, our measures of stressor exposure and appraisal were collected simultaneously as part of the same questionnaire, which may inflate associations between these measures due to common method variance (Podsakoff et al., 2003). Although our goal was to separately assess stressor exposure and perceived stress, our measure of stressor exposure was a subjective and not an objective one, and an obvious limitation of our results is that participants' reports of exposure are likely colored by participants' appraisals of these events to an unknown degree. It may be the case, for example, that participants high in trait mindfulness differ not in perceived stress but inaccurate recollection or reporting of stressor exposure. Although our work events log offers advantages over self-report measures that do not attempt to differentiate stressor exposure from perceived stress, or that ask participants to retrospectively report on exposure and perceived stress over an extended period of time, future studies might utilize more objective or real-time indicators of stressor exposure—such as body camera footage, ecological momentary assessment, or records of calls for service—to more clearly differentiate between stressor exposure and perceived stress.

In addition, we used imputed mindfulness scores for the first cohort of participants due to an error in the administration of the FFMQ-SF. While it seems unlikely that this error systematically biased our results, it did likely result in a less reliable measure of trait mindfulness. When we tested the interaction effect for daily routine stressors in cohort 2 (with non-imputed scores), we failed to replicate the significant effect observed in the full sample. This discrepancy is partly due to a drastic reduction in the sample size but could also reflect the error introduced into the assessment of trait mindfulness through our imputation procedure. Particularly given the modest effect size for the interaction in the full sample, replication in a large and independent sample is warranted. As a side note, one of the two FFMQ-SF facets that showed a significant interaction in the full sample, “describing,” did not have any items missing for cohort 1, increasing our confidence in the overall study conclusions.

It will be important to conduct replication studies in groups or populations outside of policing to test whether the moderation of perceived stress by dispositional mindfulness is a generalizable phenomenon. While the relatively balanced ratio of female-to-male officers is a strength of this study—especially considering that only 13% of the US law enforcement officers are women (Crooke, 2013)—our overwhelmingly white, non-Hispanic sample limits the generalizability of results to other racial and ethnic groups within the police profession. Additionally, about half of our sample endorsed very minimally or no exposure to acute/traumatic stressors (56 participants had mean levels  $\leq 0.25$  on the 0–3 scale; see [Supplementary Fig. 2](#)). Null findings for moderation analyses related to this component may in part reflect this restricted range of exposure, and research in a group with greater exposure to acute and traumatic stressors is needed to test whether dispositional mindfulness or resilience affects the way these stressors are perceived.

The novel work events log that we developed through this work can be used in future research on the relationship between stress exposure and perceived stress in policing, and the differential contribution of these two factors to stress-related disorders. This cross-sectional study sets the stage for research examining whether mindfulness-based interventions developed specifically for police officers (Christopher et al., 2018; Grupe et al., 2019) effectively attenuate perceptions of these routine stressors. Although stressor exposure is to a large extent inevitable for police officers, practices that allow for a different relationship to these stressors could have significant implications for officer health and well-being as well as the well-being of the communities these officers serve.

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**Author Contribution** Both authors contributed to study conception and design. SC conducted data analyses and wrote the first draft. DWG secured funding, designed and executed the study, and assisted with data analysis and writing. Both authors approved the final version of the submitted manuscript.

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**Data Availability** All data and analysis code are available at the Open Science Framework (<https://osf.io/jfwrp/>).

## Declarations

**Ethics Approval and Consent to Participate** The study received institutional review board approval from the University of Wisconsin–Madison Health Sciences IRB and was conducted in accordance with relevant national and international ethical standards. Informed consent was obtained from all study participants.

**Conflict of Interest** The authors declare no competing interests.

## References

- Ankawi, B., Slepian, P. M., Himawan, L. K., & France, C. R. (2017). Validation of the pain resilience scale in a chronic pain sample. *The Journal of Pain*, 18(8), 984–993. <https://doi.org/10.1016/j.jpain.2017.03.013>
- Bohlmeijer, E., Ten Klooster, P. M., Fledderus, M., Veehof, M., & Baer, R. (2011). Psychometric properties of the five facet mindfulness questionnaire in depressed adults and development of a short form. *Assessment*, 18(3), 308–320. <https://doi.org/10.1177/1073191111408231>
- Bell, A., Jones, K., & Fairbrother, M. (2018). Understanding and misunderstanding group mean centering: A commentary on Kelley et al.’s dangerous practice. *Quality & Quantity*, 52(5), 2031–2036. <https://doi.org/10.1007/s11135-017-0593-5>

- Bolger, N., Davis, A., & Rafaeli, E. (2003). Diary methods: Capturing life as it is lived. *Annual Review of Psychology*, *54*, 579–616. <https://doi.org/10.1146/annurev.psych.54.101601.145030>
- Bonanno, G. A. (2004). Loss, trauma, and human resilience: Have we underestimated the human capacity to thrive after extremely aversive events? *American Psychologist*, *59*(1), 20–28. <https://doi.org/10.1037/0003-066X.59.1.20>
- Brown, K. W., Weinstein, N., & Creswell, J. D. (2012). Trait mindfulness modulates neuroendocrine and affective responses to social evaluative threat. *Psychoneuroendocrinology*, *37*(12), 2037–2041. <https://doi.org/10.1016/j.psyneuen.2012.04.003>
- Christopher, M. S., Goerling, R. J., Rogers, B. S., Hunsinger, M., Baron, G., Bergman, A. L., & Zava, D. T. (2016). A pilot study evaluating the effectiveness of a mindfulness intervention on cortisol awakening response and health outcomes among law enforcement officers. *Journal of Police and Criminal Psychology*, *31*, 15–28. <https://doi.org/10.1007/s11896-015-9161-x>
- Christopher, M. S., Hunsinger, M., Goerling, R. J., Bowen, S., Rogers, B. S., Gross, C. R., Dapolonia, E., & Pruessner, J. C. (2018). Mindfulness-based resilience training to reduce health risk, stress reactivity, and aggression among law enforcement officers: A feasibility and preliminary efficacy trial. *Psychiatry Research*, *264*, 104–115. <https://doi.org/10.1016/j.psychres.2018.03.059>
- Cohen, S., & Williamson, G. (1988). Perceived stress in a probability sample of the United States. In S. Spacapan & S. Oskamp (Eds.), *The social psychology of health* (pp. 31–67). Sage Publications, Inc.
- Connor, K. M., & Davidson, J. R. (2003). Development of a new resilience scale: The Connor-Davidson resilience scale (CD-RISC). *Depression and Anxiety*, *18*(2), 76–82. <https://doi.org/10.1002/da.10113>
- Crooke, C. (2013). *Women in Law Enforcement*. Community Policing Dispatch, COPS Office. [https://cops.usdoj.gov/html/dispatch/07-2013/women\\_in\\_law\\_enforcement.asp](https://cops.usdoj.gov/html/dispatch/07-2013/women_in_law_enforcement.asp)
- Day, M. A., Lang, C. P., Newton-John, T. R., Ehde, D. M., & Jensen, M. P. (2017). A content review of cognitive process measures used in pain research within adult populations. *European Journal of Pain*, *21*(1), 45–60. <https://doi.org/10.1002/ejp.917>
- Fonagy, P., & Luyten, P. (2009). A developmental, mentalization-based approach to the understanding and treatment of borderline personality disorder. *Development and Psychopathology*, *21*(4), 1355–1381. <https://doi.org/10.1017/S0954579409990198>
- Friborg, O., Hjemdal, O., Rosenvinge, J. H., Martinussen, M., Aslaksen, P. M., & Flaten, M. A. (2006). Resilience as a moderator of pain and stress. *Journal of Psychosomatic Medicine*, *61*(2), 213–219. <https://doi.org/10.1016/j.jpsychores.2005.12.007>
- Galatzer-Levy, I. R., Brown, A. D., Henn-Haase, C., Metzler, T. J., Neylan, T. C., & Marmar, C. R. (2013). Positive and negative emotion prospectively predict trajectories of resilience and distress among high-exposure police officers. *Emotion*, *13*(3), 545–553. <https://doi.org/10.1037/a0031314>
- Gershon, R. R., Barocas, B., Canton, A. N., Li, X., & Vlahov, D. (2009). Mental, physical, and behavioral outcomes associated with perceived work stress in police officers. *Criminal Justice and Behavior*, *36*(3), 275–289. <https://doi.org/10.1177/0093854808330015>
- Grupe, D. W., McGehee, C., Smith, C., Francis, A. D., Mumford, J. A., & Davidson, R. J. (2019). Mindfulness training reduces PTSD symptoms and improves stress-related health outcomes in police officers. *Journal of Police and Criminal Psychology*, *36*(1), 72–85. <https://doi.org/10.1007/s-11896-019-09351-4>
- Grupe, D. W., Stoller, J., Mumford, J., Alonso, C., McGehee, C., Smith, C., Rosenkranz, M. A., & Davidson, R. J. (under review). The impact of mindfulness training on police officer stress, mental health, and salivary cortisol levels.
- Havnen, A., Anyan, F., Hjemdal, O., Solem, S., Gurigard Riksfjord, M., & Hagen, K. (2020). Resilience moderates negative outcome from stress during the COVID-19 pandemic: A moderated-mediation approach. *International Journal of Environmental Research and Public Health*, *17*(18), 6461. <https://doi.org/10.3390/ijerph17186461>
- Hu, T., Zhang, D., & Wang, J. (2015). A meta-analysis of the trait resilience and mental health. *Personality and Individual Differences*, *76*, 18–27. <https://doi.org/10.1016/j.paid.2014.11.039>
- James, B. J., Wilson, W., & McMains, M. J. (2006). An examination of stress hardness, dysphoria, and anger among police recruits exposed to stressful police academy training. *Journal of Police and Criminal Psychology*, *21*(2), 37–54. <https://doi.org/10.1007/BF02855683>
- Johnsen, B. H., Espevik, R., Saus, E. R., Sanden, S., Olsen, O. K., & Hystad, S. W. (2017). Hardiness as a moderator and motivation for operational duties as mediator: The relation between operational self-efficacy, performance satisfaction, and perceived strain in a simulated police training scenario. *Journal of Police and Criminal Psychology*, *32*(4), 331–339. <https://doi.org/10.1007/s11896-017-9225-1>
- Kabacoff, R. I. (2011). *R in Action*. Manning Publications Co.
- Kaplan, J. B., Christopher, M. S., & Bowen, S. (2018). Dispositional mindfulness moderates the relationship between occupational stressors and perceived stress among law enforcement personnel. *Journal of Police and Criminal Psychology*, *33*(3), 227–232. <https://doi.org/10.1007/s11896-017-9246-9>
- Kemper, K. J., Mo, X., & Khayat, R. (2015). Are mindfulness and self-compassion associated with sleep and resilience in health professionals? *The Journal of Alternative and Complementary Medicine*, *21*(8), 496–503. <https://doi.org/10.1089/acm.2014.0281>
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal and coping*. Springer.
- Lee, E. H. (2012). Review of the psychometric evidence of the perceived stress scale. *Asian Nursing Research*, *6*(4), 121–127. <https://doi.org/10.1016/j.anr.2012.08.004>
- Lieberman, A. M., Best, S. R., Metzler, T. J., Fagan, J. A., Weiss, D. S. (2002). Routine occupational stress and psychological distress in police. *Policing: An International Journal*, *25*(2), 421–441. <https://doi.org/10.1108/13639510210429437>
- Lyons, K., Radburn, C., Orr, R., & Pope, R. (2017). A profile of injuries sustained by law enforcement officers: A critical review. *International Journal of Environmental Research and Public Health*, *14*(2), 142. <https://doi.org/10.3390/ijerph14020142>
- Maguen, S., Metzler, T. J., McCaslin, S. E., Inslicht, S. S., Henn-Haase, C., Neylan, T. C., & Marmar, C. R. (2009). Routine work environment stress and PTSD symptoms in police officers. *The Journal of Nervous and Mental Disease*, *197*(10), 754–760. <https://doi.org/10.1097/NMD.0b013e3181b975f8>
- McCanlies, E. C., Mnatsakanova, A., Andrew, M. E., Burchfiel, C. M., & Violanti, J. M. (2014). Positive psychological factors are associated with lower PTSD symptoms among police officers: Post Hurricane Katrina. *Stress and Health*, *30*(5), 405–415. <https://doi.org/10.1002/smi.2615>
- McCreary, D. R., & Thompson, M. M. (2006). Development of two reliable and valid measures of stressors in policing: The operational and organizational police stress questionnaires. *International Journal of Stress Management*, *13*(4), 494–518. <https://doi.org/10.1037/1072-5245.13.4.494>
- Nieuwenhuys, A., Cañal-Bruland, R., & Oudejans, R. R. (2012). Effects of threat on police officers' shooting behavior: Anxiety, action specificity, and affective influences on perception. *Applied Cognitive Psychology*, *26*(4), 608–615. <https://doi.org/10.1002/acp.2838>
- Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical

- review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879–903. <https://doi.org/10.1037/0021-9010.88.5.879>
- Rajaratnam, S. M., Barger, L. K., Lockley, S. W., Shea, S. A., Wang, W., Landrigan, C. P., Brien, C. S., Qadri, S., Sullivan, J. P., Cade, B. E., Epstein, L. J., White, D. P., & Czeisler, C. A. (2011). Sleep disorders, health, and safety in police officers. *JAMA*, 306(23), 2567–2578. <https://doi.org/10.1001/jama.2011.1851>
- Rosenkranz, M. A., Lutz, A., & Davidson, R. J. (2016). Reduced stress and inflammatory responsiveness in experienced meditators compared to a matched healthy control group. *Psychoneuroendocrinology*, 68, 117–125. <https://doi.org/10.1016/j.psyneuen.2016.02.013>
- Rowe, M., McCrae, C., Campbell, J., Horne, C., Tieg, T., Lehman, B., & Cheng, J. (2008). Actigraphy in older adults: Comparison of means and variability of three different aggregates of measurement. *Behavioral Sleep Medicine*, 6(2), 127–145. <https://doi.org/10.1080/15402000801952872>
- Scheers, T., Philippaerts, R., & Lefevre, J. (2012). Variability in physical activity patterns as measured by the SenseWear Armband: How many days are needed? *European Journal of Applied Physiology*, 112(5), 1653–1662. <https://doi.org/10.1007/s00421-011-2131-9>
- Shane, J. M. (2010). Organizational stressors and police performance. *Journal of Criminal Justice*, 38(4), 807–818. <https://doi.org/10.1016/j.jcrimjus.2010.05.008>
- Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: Assessing the ability to bounce back. *International Journal of Behavioral Medicine*, 15(3), 194–200. <https://doi.org/10.1080/10705500802222972>
- Southwick, S. M., Bonanno, G. A., Masten, A. S., Panter-Brick, C., & Yehuda, R. (2014). Resilience definitions, theory, and challenges: Interdisciplinary perspectives. *European Journal of Psychotraumatology*, 5(1), 25338. <https://doi.org/10.3402/ejpt.v5.25338>
- Syed, S., Ashwick, R., Schlosser, M., Jones, R., Rowe, S., & Billings, J. (2020). Global prevalence and risk factors for mental health problems in police personnel: A systematic review and meta-analysis. *Occupational and Environmental Medicine*, 77(11), 1–11. <https://doi.org/10.1136/oemed-2020-106498>
- Tang, T. L. P., & Hammontree, M. L. (1992). The effects of hardiness, police stress, and life stress on police officers' illness and absenteeism. *Public Personnel Management*, 21(4), 493–510. <https://doi.org/10.1177/009102609202100406>
- Tuckey, M. R., Winwood, P. C., & Dollard, M. F. (2012). Psychosocial culture and pathways to psychological injury within policing. *Police Practice and Research*, 13(3), 224–240. <https://doi.org/10.1080/15614263.2011.574072>
- Van Gelderen, B. R., Konijn, E. A., & Bakker, A. B. (2017). Emotional labor among police officers: A diary study relating strain, emotional labor, and service performance. *The International Journal of Human Resource Management*, 28(6), 852–879. <https://doi.org/10.1080/09585192.2016.1138500>
- Waters, J. A., & Ussery, W. (2007). Police stress: History, contributing factors, symptoms, and interventions. *Policing: An International Journal*, 30(2), 169–188. <https://doi.org/10.1108/13639510710753199>
- Webster, J. H. (2013). Police officer perceptions of occupational stress: The state of the art. *Policing: An International Journal*, 36(1), 96–118. <https://doi.org/10.1108/13639511311302498>
- Wielgosz, J., Goldberg, S. B., Kral, T. R., Dunne, J. D., & Davidson, R. J. (2019). Mindfulness meditation and psychopathology. *Annual Review of Clinical Psychology*, 15, 285–316. <https://doi.org/10.1146/annurev-clinpsy-021815-093423>

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