Final Research Report
Cover Page

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U.S. Department of Justice
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National Institute of Justice
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Project Title: Defining Impact of Stress and Traumatic Events on Corrections Officers
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Reporting Period: January 5, 2018 – December 31, 2021*

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Summary of the Project:

Major Goals and Objectives:
Our overarching goal was to understand and effectively reduce chronic stress among corrections officers (COs). To accomplish this goal, this study had two inter-related objectives:

Objective 1: Perform a prospective 18-month observational study of approximately 400 CO's to relate their stress levels to a) correctional work-related contributors to stress and b) impacts of stress on work performance and economic costs. We also used the initial cross-sectional stress levels to identify a higher (n=30) and lower stress (n=30) sub-cohort for objective 2.

Objective 2: We evaluated a higher (n=30) and lower (n=30) stress sub-cohort for an extensive assessment including event-related fMRI and biomarkers of hormonal dysregulation and cardiometabolic risk. We a) identified alterations in neurocognitive processes affected by stress and b) assessed the ability of a stress index, comprised of easily accessible clinical biomarkers, to identify CO's with higher stress levels and reduced activation of neurocognitive brain regions via fMRI.

Research Questions:
1. How did stress levels among COs relate to work contributors of stress and work performance?
2. What were the relationships between fMRI, biomarker tests and stress in higher and lower stress sub-cohorts?

Research Design, methods, analytical and data analysis techniques for Objectives 1 & 2:
The following baseline research design and methods is also published in doi:10.4236/ojpm.2021.116019
The footnotes reference citations from this publications and can be accessed at this link.

Participants
This study was a cross-sectional survey assessment of Oregon corrections professionals working directly with adults in custody (AIC's). Participants were recruited from six Oregon Department of Corrections facilities within 50 miles of Oregon Health & Science University in Portland, Oregon.

All corrections staff were eligible to participate in the baseline survey if they worked directly with AIC's for at least one month. If a participant was no longer working for the Oregon Department of Corrections at one of the six participating facilities they were no longer eligible to participate in the follow-up survey.

Participants responded to surveys which concurrently addressed various work and stress related questions regarding their overall opinions or experiences within the past month.

Surveys
Both baseline and follow-up surveys included information on demographics, work history, perceived stress, and occupational constructs. Baseline self-report surveys were conducted with pen and paper, administered and collected on-site at each participating correctional facility during day, swing, and night shifts over several days from . Researchers toured the facility and delivered surveys directly at each post for those who were interested in participating. Site liaisons and staff coverage allowed staff to complete surveys during their work shift. These paper surveys were scanned and cleaned by researchers using Tele Form software system. Written informed consent was obtained prior to participation.

Those who participated in the baseline survey were invited to participant in the follow-up survey using their Oregon Department of Corrections e-mail from August to November 2020. Online follow-up surveys included similar demographic, work history, stress, and occupational construct variables as the baseline survey. This follow-up survey also included questions regarding exposure and associates life effects due to the coronavirus (COVID-19) pandemic.

Demographics and Work History

Demographics collected included age (years), gender, race (Asian, Black/African American, Native American/Native Alaskan, Native Hawaiian/Other Pacific Islander, Hispanic/Latino, more than one race, and Non-Hispanic white), education (high school/General Educational Development GED/some college, two-year Associates degree, or four-year Bachelor's degree/more), current relationship status (married/partnered or not married/partnered), and military service (ever active duty in U.S. armed services or never served). Work history variables included time employed at current facility (years), security level of AIC's primarily worked with in the past month (minim, medium, or maximum security), post primarily worked in the past month (non-housing, general population, or special housing/segregation units), shift primarily worked in the past month (day, swing, night), and average hours worked per week in the past month.

Perceived Stress

The Perceived Stress Scale (PSS-4 Short Form) [15] was used to measure perceived stress among participants. For this construct, participants rated on a five-point Likert scale (1 = None of the time, 5 = All of the time) how often they felt in the past month about the following: that they were able to control important things in their life, confident about their ability to handle personal problems, that things were going their way, and that difficulties were piling up so high that you could not overcome them. A total stress score was created by adding the responses from the four questions after reverse coding for the first three questions.

Occupational Constructs

Based on previous research, the following occupational constructs were examined as potential predictors of stress among corrections professionals: factors related specifically to the job itself, including work-related stress [16] [17] and work overload [18]; factors related to environment, such as environmental safety and dangerousness [16] [17] [18] [19], possibility of AIC conflict [20] [21], and experienced and witnessed violence [14]; organizational-specific conditions such as organizational and operational stressors [13] [22] [23], resource insufficiency [20] [21], procedural justice, and organizational support [16] [17] [24]; relationships at work, such as supervisor [17] [18], and coworker support [16]; other stressors outside of work, such as public image [18]; and contentment including job satisfaction [17] and intentions to quit [25].

Occupational constructs also include Likert scale responses. Resource insufficiency, possibility of AIC conflict, organizational stressors, operational stressors include ratings for how much of the following as contributed to stress experienced in the past month (1 = not at all, 5 = very much) in respect to corrections professionals' resources (management support, guidelines), AIC relations (possibility of violence and incidents), administration (staff shortages, leadership styles), and work life balance (shift work, over-time demands, social life limitations) respectively. Experienced and witnessed violence constructs included how often have threat, assaults without a weapon, and assaults with a weapon have occurred during the last six months (0 = rarely, less than once a month, 4 = more than a week), which was later reclassified to rarely (less than once a month) and once a month or more due to limited distribution of responses. The remaining constructs included ratings about overall agreement (1 = Strong

disagree, 5 = strongly agree). Work-related stress rates negative feelings towards (fatigue, worry, anger), while work overload assesses difficulty and complexity of job demands. For the environmental safety and dangerousness constructs participants rate perceived risk among AICs. Supervisor, co-worker, and organizational support assesses negative feelings towards supervisors, co-workers, and the current institution's ability to assist with job demands. Procedural justice refers to inconsistent and unclear policies and organizational decision-making. Public image refers to participants' attitudes towards negative media coverage in the portrayal of corrections professionals' role. Job satisfaction includes questions related to positive attitudes towards current work (enjoyment, pride) and intentions to quit reflect attitudes towards leaving corrections work or current facility.

COVID-19 exposure and life effects

The follow-up survey also included questions regarding coronavirus (COVID-19) exposure and the impact of the pandemic on daily living. For example, yes or no questions to the following to being diagnosed with COVID-19, having symptoms believed to be COVID-19 without getting testing, having someone other than themselves in their household having confirmed COVID-19, one or more of co-workers having confirmed COVID-19, having confirmed COVID-19 cases at their corrections facility, and having one or more AIC's they directly work being diagnosed with COVID-19. An overall total exposure score was created by adding together the number of yes responses to these exposure questions, where a higher score would indicate more COVID-19 exposures.

In addition, how COVID-19 has impacted participants lives and contributed to stress was assessed by utilizing some questions from the Coronavirus Impact Scale by Drs. Joan Kaufman and Joel Stoddard. Participants were asked to rate how COVID-19 has impacted certain aspects of their lives from none (0) to severe (3) in regards to routine, family income and employment, food access, medical health care access, mental health treatment access, access to extended family and non-family social supports, experiences of stress related to the pandemic, and precautions with household members living with you. An overall average COVID-19 life effect score was created by averaging the scores across these COVID-19 life effect questions to account for the average change, or impact, the pandemic has caused in corrections professionals' lives.

Statistical Analyses for Objective 1

For both the baseline and follow-up survey, perceived stress was analyzed using a linear mixed effects regression model, with a random effect for the six different correctional facilities to account for the correlation among corrections professionals within each facility. A purposeful selection approach [26] was used to build the model considering the occupational constructs, demographics, and work history variables as possible predictors of perceived stress. Lastly, model diagnostics confirmed the final model by checking model assumptions. The statistical software R version 3.6.2 was used to conduct all statistical analyses.

Expected applicability of the research

This project used highly innovative technology to provide a fundamental understanding of the adverse impact of CO stress on neurocognitive function and decision-making, findings that have immediate impacts on work performance. We have identified work characteristics and factors which contribute to and predict chronic stress. Those findings described in the results section will inform and potentially change policy. While this project's results is not without limitations, it provided data that is translatable and transferable to other law enforcement occupations. This project immediately enhances CO well-being and recognizes that collateral consequences may extend to their families bringing those issues to the forefront of how stress impacts health and the relationship to work related depression, PTSD, and

suicide rate among CO's. This project will provide the necessary assessment methodology and biomarkers that can be used to assess future wellness programs for CO well-being. *See, also discussion section for further information on expected applicability.*

Participants and other collaborating organizations
In addition to the research participants enrolled in the project, the Oregon Department of Corrections Director Colette Peters, executive leadership team, research leadership committee and wellness committee chair collaborated in all aspects of this project.

Changes in approach from original design and reason for change, if applicable
Not applicable

Outcomes
Activities/Accomplishment
As detailed in our bi-annual progress reports and in the results and products section below, the research team has completed numerous activities in support of the aims. The activities not captured in the results and products section are detailed here: training junior research personnel, creating surveys with reliable constructs, drafting research protocols, completing data compilation and cleaning, maintaining institutional review board approvals, completing all internal and external reporting requirements, meeting regularly with stakeholders at the Oregon DOC.

Results/Findings Objective 1 (Objective 2 Analyses in progress)
The following baseline research results are also published in doi:10.4236/ojpm.2021.116019

Participation varied across the six facilities and averaged 34%, with a total of 330 surveys collected. Thirty-four participants were excluded from analysis due to missing information for perceived stress, occupational constructs, demographics, or work history (n = 296). However, no more than 1.5% were missing for any one variable.

Demographic, work history characteristics, and perceived stress among the final sample (n = 296) are described in Table 1. Participants were mostly middle aged (43.6 ±11.6 years) and the distribution of gender (36.5% female) matches that of Oregon corrections as a whole, which employs about 30% females. A large percentage of the final sample is non-Hispanic white, which is consistent with the demographics of Oregon. For final analyses, race was dichotomized as Non-Hispanic white (n = 235, 79.4%) versus other (n = 61, 20.6%), including non-white, Hispanic, or more than one race. The highest level of education for most is a high school diploma, General Educational Development (GED), or some college compared to a two-year Associate's degree or more. Further, 70.3% of participants are married or otherwise partnered and 24.3% served active duty in the military. The average time worked at participants current correctional facility was 7.78 Å} 6.58 years, ranging from one month (0.08 years) to 29.3 years. The highest percentage of the sample primarily worked with medium security AIC's in the past month (43.9%). In addition, the majority of primality worked in non-housing (40.5%) or general population unit posts (42.9%) and day shift (58.8%) in the past month. Participants worked an average of 44.4 ± 7.78 hours per week, ranging from 10 to 80 hours. The average perceived stress score (PSS-4 Short Form) (15) was 9.33 ±2.71, ranging from a minimum score of four to a maximum score of 18, and slightly skewed to the right (Figure 1).

Prior to use in the regression model, the consistency of the occupational constructs was determined using Cronbach's alpha (α) to ensure inter-reliability (α > 0.70) using IBM SPSS Statistics 25. Each of these occupational constructs maintained inter-reliability among the sample (Cronbach's α > 0.74).

Unadjusted regressions with perceived stress as the outcome (Table 2) found insignificant associations with gender (p = 0.84), AIC's security level (p = 0.39), shift (p = 0.36), years employed at current facility (p = 0.31). Measures significantly associated with perceived stress (using α = 0.25) were work-related stress, work overload, environmental safety/dangerousness, possibility of AIC conflict, organizational stressors, operational stressors, resource insufficiency, procedural justice, organizational support, supervisor support, co-worker support, job satisfaction, intentions to quit, public image, age (all p < 0.001), experience violence (p = 0.01), relationship status (p = 0.02), work hours (p = 0.02), witnessed violence (p = 0.06), education (p = 0.08), post (p = 0.18), race (p = 0.20), and military service (p = 0.24).

All associations between demographic, work history, and occupational constructs were assessed before the model building process to eliminate multi- collinearity. Possibility of conflict, organizational stressors, supervisor support, and education were excluded in the rest of the model building progress due to their strong relationship with other variables in the model. More specifically, organizational stressors is significantly related to resource insufficiency (r = 0.84), work-related stress (r = 0.66), and supervisor support (r = 0.65); possibility of conflict related with environmental safety/dangerousness (r = 0.57); supervisor support related with procedural justice (r = 0.66) and co-worker support (r = 0.51) (all p's < 0.001); and education related to post ($\chi 2 = 13.12$, p = 0.01).

After purposeful selection with the included variables significantly associated with perceived stress, the variables remaining in the perceived stress model were work-related stress, operational stressors, procedural justice, job satisfaction, relationship status, work hours, and time employed at current facility. Model diagnostics indicated the final model was a good fit (Variance Inflation Factor > 5, residual plots showed no major deviations from model assumptions, and overall model p < 0.001), and no additional transformations were necessary.

Results from the final model (Table 3) found that perceived stress increases with increased work-related stress (p = 0.02), work hours (p = 0.03), operational stressors (p = 0.002), and lack of procedural injustice (p = 0.03), and decreases with more time employed at current facility (p = 0.06), improved job satisfaction (p < 0.001), and among married or partnered individuals (p = 0.05).

Standardized estimates of the final model were also created for each participant based on the difference of each score from the mean divided by the standard deviation. Based on these standardized estimates, operational stressors accounted for the greatest increase in perceived stress (β = 0.57), while job satisfaction accounted for the greatest decrease (β = −0.58). Average hours worked per week (β = 0.31) and lack of procedural justice (β = 0.32) accounted for the smallest increase in perceived stress, while time employed at current facility (β = −0.25).

Follow-up survey (preliminary results)

Two hundred and eighty four of 329 corrections professionals (86.32%) were eligible for the follow-up survey because they continued to work for six participating Oregon Department of Correction facilities, with one participant considered as inactive because they moved to a non-participating facility. Of the 284 eligible corrections professionals, 166 completed the follow-up survey, which is 58.45% of the eligible participants. Further, of the 329 corrections professionals who originally completed the baseline survey, 50.46% completed the follow-up survey. However, of the 166 who completed the survey, only

128 had complete data that could be used for the follow-up perceived stress data analysis. This means that of the 296 corrections professionals that had complete baseline survey data that was previously analyzed, 43.24% participants were retained for follow-up perceived stress data analysis.

Results from the follow-up survey indicate that there were no significant differences in acute stress from over time self-reported by corrections professionals. For example, there was no significant difference in perceived stress scores from baseline to follow-up, or for the subset of participants from baseline to fMRI and from fMRI to follow-up (paired t-tests, ps > 0.05).

Linear regressions were conducted to determine the effect of COVID-19 exposure and life effect on the outcome of perceived stress at follow-up. Results that there is a significant association with perceived stress at follow-up and total sum of COVID-19 exposures, where stress increases with an increase in the total COVID-19 exposure (p=0.003). Specifically, there was a significant associations with corrections professional's self-report stress over the last month if they have been directly working with inmates diagnosed with COVID-19 (p=0.007), or one or more of their co-workers have had confirmed COVID-19 (p=0.043). All other associations were insignificant when considering the outcome of overall acute stress levels, including being diagnosed with COVID-19 themselves (p=0.054), having symptoms but not getting tested (p=0.394), someone other than themselves in their household being diagnosed (p=0.137), or confirmed cases at their current facility (p=0.273).

Further, linear regression suggests there was a significant association with the average COVID-19 life effect ratings and perceived stress at follow-up, with perceived stress increasing with an increase in average life effect scores (p< 0.001). More specifically, ANOVA analysis results indicate that the following had significant associations with increases in perceived stress: moderate (p= 0.012) and severe (p<0.001) changes in experiences of stress related to the pandemic; moderate (p=0.029) and severe (p<0.001) changes in food access; moderate (p=0.035) and severe (p<0.001) changes in family incomes or employment; and severe change in mental health treatment (p<0.001). In contrast, there were no significant associations with perceived stress and changes in precautions with household members (p=0.838) or access to extended family and non-family social supports (p=0.222).

Thirty eight participants were excluded from analysis due to missing information for perceived stress, COVID-19 or occupational constructs, demographics, or work history (n= 128). However, those who were missing variables were those who did not fully complete the online survey but rather stopped it and didn't answer all the questions. Follow-up survey demographic, work history characteristics, and perceived stress among the final sample (n = 128) are described in Table 4. The demographics and work history variables of the participants were similar to the baseline survey (Table 1), although additional sensitivity analysis would need to be conducted to consider if there are significant differences in the characteristics of participants who completed the follow-up survey compared to those who were excluded due to eligibility reasons or if they were eligible but did not complete.

Prior to the use in the follow-up survey regression model, the consistency of the occupational constructs were again determined using Cronbach's alpha to ensure the inter-reliability remained consist in comparison to the baseline survey in which Cronbach's alpha was greater than 0.74. These results suggest that these occupational constructs hold reliable among this sample of corrections professional, even over time.

Unadjusted regressions with perceived stress as the outcome (Table 5) found insignificant associations (p > 0.05) with relationship status (p=0.80), military service (p=0.73), race (p=0.72), experienced violence

(p=0.69), average work hours (p=0.47), witnessed violence (p=0.26), public image (p=0.24), gender (p=0.16), possibility of conflict (p=0.10), environmental safety/ dangerousness (p=0.08), time at current facility (p=0.06), and job satisfaction (p=0.06). In addition ANOVA analysis found insignificant associations with perceived stress and shift (p=0.70), AIC security level (p=0.62), and education (p=0.57), but significant associations with post (p=0.046). In contrast there were significant associations with perceived stress and COVID-19 exposure, COVID-19 life effect, work-related stress, organizational and operations stressors, resource insufficiency, organizational and supervisor support, intentions to quit and age ($p < 0.001$) as well as lack of procedural justice (p=0.001), co-worker support (p=0.008), and work overload (p=0.04).

Similar to the baseline model, associations between demographic, work history, and occupational constructs were assessed before the model building process to eliminate multi collinearity. Possibility of conflict, organizational stressors, supervisor sup-port, and education were excluded in the rest of the model building progress due to their strong relationship with other variables in the model (Ballin et al., 2021).

For the purposes of purposeful selection model building (Bursac et al., 2008), initial univariate associations (Table 5) and ANOVA results with a p-value greater than 0.25 were excluded from the model and later assessed for confounding effect. After purposeful selection with the included variables significantly associated with perceived stress, the variables remaining in the perceived stress model were work-related stress, work-overload, post, job satisfaction, COVID-19 total exposure, age, co-worker support, intentions to quit, gender, race, shift, adults in custody (AIC) security level, time at current facility, average COVID-19 life effect, experienced and witnessed violence, environmental safety/ dangerousness, organizational support, resource insufficiency, lack of procedural justice, operational stressors, and public image. Model diagnostics indicated the final model was a good fit (Variance Inflation Factor > 5, residual plots showed no major deviations from model assumptions, and overall model $p < 0.001$), and no additional transformations were necessary.

Supplemental Table 1 indicates this full model with considering all associated variables when considering perceived stress at follow-up. Results from the final model (Table 6) found that when considering all other confounding variables (gender, race, shift, adults in custody (AIC) security level, time at current facility, average COVID-19 life effect, experienced and witnessed violence, environmental safety/ dangerousness, organizational support, resource insufficiency, lack of procedural justice, operational stressors, and public image), significant increases in perceived stress can be predicted by increases in work-related stress ($p< 0.001$), job satisfaction (p=0.007), total COVID-19 exposures (p=0.01), co-worker support (p=0.03), and intentions to quit (p=0.03). Furthermore, when considering these confounding factors in the model, perceived stress can be predicted to decrease with increases in work overload ($p<0.001$), and age (p=0.02) as well as post positions at general population unit (p=0.004) and special housing units (p=0.007) compared to non-housing units.

Standardized estimates of the final model were also created for each participant based on the difference of each score from the mean divided by the standard deviation. Based on these standardized estimates when considering all other confounding variables in the model and when considering occupational constructs, work-related stress had the greatest effect on the increase of perceived stress score (beta= 1.43). In terms of work history, post also had greater effects in decreasing stress among the general population unit (beta= -1.26) and special housing (beta = -1.70).

Further longitudinal linear mixed effects analysis must be conducted to see how demographics, work-history, occupational constructs, and COVID-19 factors affect changes in acute perceived stress over time. The results from this preliminary follow-up survey indicate that many factors not considered during the baseline survey model building were included due to greater effect change in beta values when being removed from the model. This indicates that COVID-19 related factors could have potentially influenced this change, shifting attitudes towards occupational and work history related variables over time and therefore affecting the overall perceived stress scores. Although there was no significant difference in perceived stress over time, future analysis could consider reviewing the longitudinal effects of these constructs using the same purposeful selection approach in order to determine which factors are the greatest predictor of acute stress changes over time. These preliminary results indicate that factors no before considered in the baseline model, such as work-overload (increased work responsibilities), post, age, co-worker support, intentions to quit (leaving current job), pubic image (negative image of corrections work perceived by public), experienced and witnessed violence, organizational support (from department and management), resource insufficiency (understaffing management support), gender, race, environmental safety/dangerousness (alertness and concern around AICs), shift, and AIC security level should also be considered as influences with perceived stress, especially when considering COVID-19 exposure and life changes during the follow-up survey time period. Future analysis can also look at work performance information such as if these variables over time also affect self-reported worker's compensation claims in the past year or missed work days due to injury.

Discussion for Objective 1 (Objective 2 Analyses in progress)

This study found significant associations between perceived stress among corrections professionals and age, relationship status, and various occupational conditions, such as job specific stress (work-related stress, work overload), environmental (environmental safety and dangerousness, possibility of conflict, experienced violence), organizational (organizational and operational stressors, resource insufficiency, procedural justice, organizational support), work relationships (supervisor and co-worker support), job contentment (job satisfaction and intentions to quit), and outside of work (public image). When considering all possible demographic, work history, and occupational constructs included in this study using a purposeful selection approach, results indicate that corrections professionals' perceived stress increases with work-related stress, longer work hours, increased operational stressors, and lack of procedural justice. Factors reducing perceived stress included increased job satisfaction, longer tenure at a facility, and being partnered or married. Results also suggest that corrections work-related stress is most influenced by operational stressors and job satisfaction. Certain of these factors align with prior findings among occupational groups. Work-related stress [16] [17] refers to negative overall feelings towards work such as tension, fatigue, pressure, frustration, anger and worry. It is known that increases in stress at work contributes to overall perceptions of stress. In fact, a 2019 American Psychological Association report found that 64% of adults in the United States cited work as a significant source of stress [27]. Therefore, further exploring the occupational factors that remained in the stress model are also important to address in terms of mitigating stress among high stress occupations. Operational stressors were constructs found to be significantly associated with perceived stress among corrections professionals. In this study, operational stressors [13] [22] [23] refer to occupational issues that contributed most to stress in the past month, such as shift work, mandatory overtime, and difficulty with work-life balance, such as managing social life outside of work, limited availability to spend with family and friends, and feeling like always on the job. This means when considering work-specific stressors, negative feelings towards these operational type factors are associated with increases in overall stress. In addition, increases in work hours also contributed to stress, suggesting more hours spent at work also increases stress. The economic returns on the additional hours did not seem to mitigate the negative impact of long hours. These findings are consistent with previous research

suggesting increases in occupational health issues [28] and work-family conflict [29] among those who work longer hours. This is especially apparent in an occupation such as corrections, which can require mandatory overtime to maintain operations. Procedural justice [16] [17] [24] in this study refers to fairness of work-related procedures, such as inconsistencies with polices, rules and regulations in regard to disciplinary actions and promotions. A systematic review including the occupational constructs considered in this study, found that organizational structure and climate of correctional facilities have the most consistent relationship with work-related stress and burnout among staff [13]. These factors include unclear goals and policies, lack of procedural justice, lack of decision-making ability, and lack of organizational support. These findings are similar to the results of this study that procedural justice was most associated with increases in perceived stress. Results also found that increases in job satisfaction, which included enjoyment and pride in their job, were a protective factor for stress among corrections professionals. Other research also finds that job satisfaction is negatively associated with work-related stress, whereas positively associated with hope and self-efficacy [30]. In addition, current research suggests increasing social support at work in order to significantly reduce the impact of job demands and improve job satisfaction [20]

Conclusion for Objective 1 (Objective 2 Analyses in progress)
This study has identified possible predictors of stress among Oregon corrections professionals. These findings can inform the development of policy changes that improve working conditions among this high stress occupation. Further, interventions addressing these factors determined as the greatest predictors of stress can improve corrections professionals' mental well-being, physical health, job performance, and other economic outcomes.

The High stress group shows greater activation in right middle frontal gyrus to the blocks of incongruent trials – the trials that have conflicting information – than the neutral trial. The specific region that demonstrated differential activation is involved in sustaining attention to the goals of what someone is supposed to be doing and ignoring distracting information.

On the other hand, the Low stress group activated a sub-cortical brain region that can be involved in inhibiting response in a more automatic manner (Table 7 and Figure 2). It can seem counterintuitive that a more highly stressed group that performed more slowly on an inhibition task would recruit more attentional control measures than a less stressed group that performed more quickly on an inhibition task – but in this controlled setting, inhibiting distracting information and incorrect responding is less cognitively effortful.

If these findings continue to hold under further analysis in our own sample and through replication, this could suggest that under higher demand situations, high stress individuals may not be able to inhibit inappropriate or automatic responding as well as their low stress counterparts.

Participants in the HS high stress group (N = 13) demonstrated greater activation of a frontal-parietal executive network implicated in cognitive control than the low stress group (N = 14; $p < 0.01$, uncorrected). In particular, the HS high stress group demonstrated particularly robust activation of posterior dorsolateral prefrontal cortex (DLPFC; BA 9) and middle frontal gyrus. Both regions are involved in proactive task maintenance, meaning maintaining attention to what information from the conflicting information is relevant (color information from ink color and not word) and engaging in the correct task (naming the ink color and not reading, the automatic thing we do). See Figure 3. In contrast, the LS low stress group demonstrated greater activation of some bottom-processing regions that may be involved in basic visual processing. (Figure 3; Kuehl at el., in preparation)

Limitations

There are limitations of this study limiting the generalizability or results, including small sample size, low participation rate (34% across facilities), and reduced geographical sampling distribution. Despite these limitations, our sample represented of the Oregon Department of Corrections' demographics. Further, controlling for the random effect of facility accounted for within facility differences to account for generalizing results to other correctional facilities in Oregon.

Artifacts

Products

1. Ballin, J., Niederhausen, M., Kuehl, K., Elliot, D., DeFrancesco, C. & McGinnis, W. (2021). Defining stress among Oregon corrections professionals. *Open Journal of Preventive Medicine,* 11(6), 237-250. doi:10.4236/ojpm.2021.116019.

2. Kuehl, K., Mackiewicz-Seghete, K., Elliot, D., Ballin, J., DeFrancesco, C., McGinnis, W. & Gallemore, K. (2021). Workers with higher stress levels have alternations in neuroimaging. Virtual oral presentation at Society of Behavioral Medicine (SBM.

3. Kuehl, K., Mackiewicz-Seghete, K., Elliot, D., Ballin, J., DeFrancesco, C., McGinnis, W. & Gallemore, K. (2021). Workers with higher stress levels have alternations in neuroimaging. Virtual oral presentation at Western Medical Research Conference (WMRC).

4. Ballin, J., Kuehl, K., Elliot, D., Neiderhausen, M., McGinnis, W. & DeFrancesco, C., Defining stress among Oregon corrections professionals (2020). Virtual oral presentation at Oregon Public Health Association (OPHA) Annual Conference.

5. Ballin, J., Kuehl, K., Elliot, D., Neiderhausen, M., McGinnis, W. & DeFrancesco, C., Defining stress among Oregon corrections professionals (2020). Virtual oral presentation at American Public Health Association (APHA) Annual Meeting.

6. Ballin, J., Kuehl, K., Elliot, D., Neiderhausen, M., McGinnis, W. & DeFrancesco, C., Defining stress among Oregon corrections professionals (2020). Virtual oral presentation at Oregon Health & Science University-Portland State University School of Public Health (OHSU-PSU SPH) Annual Public Health Conference.

7. Drs. Kuehl and Seghete presented information on the background and research plans for this project to the OHSU community during General Internal Medicine Grand Rounds on November 3, 2021.

8. Kuehl, K., Mackiewicz-Seghete, K., Elliot, D., Ballin, J., DeFrancesco, C., McGinnis, W. & Gallemore, K. (in preparation). Alterations in Neuroimaging among Higher Stress Corrections Professionals.

9. NIJ Grant #2020 R2-CX-0006 *Corrections Work's Adverse Effects and a Total Worker Health Program to Enhance Well-being* (1/1/2021 – 12/31/2023): These unique findings of the project described in this final report were instrumental in designing this follow-up project which

includes an innovative wellness program with the priority to make it scalable to other corrections departments across the country.

Data sets generated (broad descriptions will suffice)

The data generated from this research includes a de-identified data set (participant ID numbers and scantron survey barcode ID numbers only) among a sample of corrections professionals working in six different Oregon Department of Corrections facilities within 50 miles of Portland, Oregon. Baseline and follow-up survey data as well as data among a subset of higher and lower stress participants includes, demographic and work history variables. In addition, occupational constructs including Likert scale questions and final scores are created for this data set are also included at baseline and follow-up, with additional COVID-19 exposure and life effect constructs added to the follow-up survey. Perceived stress measures as well as overall stress, depression, and anxiety scores are also included at baseline, fMRI and follow-up. The following biomarkers were also collected for the subset of high and low stress identified participants prior to fMRI scan: body mass index (BMI), systolic and diastolic blood pressure (mmHg), total cholesterol, low- and high-density lipoprotein (LDL/HDL) cholesterol, triglycerides (mg/dL), hemoglobin A1c (%), and C-reactive protein (CRP; mg/L), Interleukin-6 (IL-6; pg/L). Salivary cortisol samples were also collected and recorded on two consecutive days after fMRI testing five minutes after waking, 30 minutes after waking (peak), and five minutes before bed. Average cortisol (mcg/dL) values over the two days were analyzed for at wake, peak, and at bed time. In addition, the area under the curve (AUC) for cortisol over time was calculated for each day then averaged. Further, accuracy and reaction time results for the executive function Stroop task conducted while in the fMRI was also collected along with associated fMRI brain activity data. Additional fMRI and Stroop related data was also collected including sleepiness scales, task performance motivation responses, as well as previous alcohol, medication, and caffeine intake before completing the task.

Dissemination activities

Dissemination activities include the products (publications, presentations) and activities (meetings with stakeholder committees) listed above.

1. NIJ Grant ## 2020 R2-CX-0006 *Corrections Work's Adverse Effects and a Total Worker Health Program to Enhance Well-being* (1/1/2021 – 12/31/2023): These unique findings of the project described in this final report were instrumental in designing this follow-up project which includes an innovative wellness program with the priority to make it scalable to other corrections departments across the country.

2. Dr. Kerry Kuehl and Oregon Department of Corrections Director Colette Peters, who is also chair of the National Corrections Wellness Committee of the National Institute of Corrections, co-presented on the need to incorporate wellness to Oregon Department of Corrections leadership team in June 2020

3. Ballin, J., Niederhausen, M., Kuehl, K., Elliot, D., DeFrancesco, C. & McGinnis, W. (2021). Defining stress among Oregon corrections professionals. *Open Journal of Preventive Medicine,* 11(6), 237-250. doi:10.4236/ojpm.2021.116019.

4. Kuehl, K., Mackiewicz-Seghete, K., Elliot, D., Ballin, J., DeFrancesco, C., McGinnis, W. & Gallemore, K. (2021). Workers with higher stress levels have alternations in neuroimaging. Virtual oral presentation at Society of Behavioral Medicine (SBM).

5. Kuehl, K., Mackiewicz-Seghete, K., Elliot, D., Ballin, J., DeFrancesco, C., McGinnis, W. & Gallemore, K. (2021). Workers with higher stress levels have alternations in neuroimaging. Virtual oral presentation at Western Medical Research Conference (WMRC).

6. Ballin, J., Kuehl, K., Elliot, D., Neiderhausen, M., McGinnis, W. & DeFrancesco, C., Defining stress among Oregon corrections professionals (2020). Virtual oral presentation at Oregon Public Health Association (OPHA) Annual Conference.

7. Ballin, J., Kuehl, K., Elliot, D., Neiderhausen, M., McGinnis, W. & DeFrancesco, C., Defining stress among Oregon corrections professionals (2020). Virtual oral presentation at American Public Health Association (APHA) Annual Meeting.

8. Ballin, J., Kuehl, K., Elliot, D., Neiderhausen, M., McGinnis, W. & DeFrancesco, C., Defining stress among Oregon corrections professionals (2020). Virtual oral presentation at Oregon Health & Science University-Portland State University School of Public Health (OHSU-PSU SPH) Annual Public Health Conference.

9. Drs. Kuehl and Seghete presented information on the background and research plans for this project to the OHSU community during General Internal Medicine Grand Rounds on November 3, 2021.

10. Kuehl, K., Mackiewicz-Seghete, K., Elliot, D., Ballin, J., DeFrancesco, C., McGinnis, W. & Gallemore, K. (in preparation). Alterations in Neuroimaging among Higher Stress Corrections Professionals.

Appendix (Ballin et al.,2021)

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Table 1. Corrections professionals' demographics and work history at baseline (n=296).

	n (%)
Age, years (Mean ± SD) [Min, Max]	43.6 ± 11.6 [22, 73]
Gender	
Female	108 (36.5%)
Male	188 (63.5%)
Race*	
White (Non-Hispanic)	278 (84.2%)
Hispanic/Latino	35 (10.6%)
Native American/Native Alaskan	19 (5.8%)
Black/African American	10 (3.0%)
Asian	9 (2.7%)
Native Hawaiian/Other Pacific Islander	6 (1.8%)
Other	5 (1.5%)
Education	
High school/GED or some college	151 (51.0%)
Two-year college degree (Associate's)	59 (19.9%)
Four-year college degree (Bachelor's) or more	86 (29.1%)
Relationship status	
Not married or otherwise partnered	88 (29.7%)
Married or otherwise partnered	208 (70.3%)
Military service *(ever active duty in U.S. Armed forces)*	
No	224 (75.7%)
Yes	72 (24.3%)
Time employed at current facility, years (Mean ± SD) [Min, Max]	7.78 ± 6.58 [0.08, 29.3]
Security level of Adults in Custody (AIC's), primarily worked with in the past month	
Minimum	75 (25.3%)
Medium	130 (43.9%)
Maximum	91 (30.7%)
Post, primarily worked in the past month	
Non-housing unit	120 (40.5%)
General population housing unit	127 (42.9%)
Special housing/segregation unit	49 (16.6%)
Shift, primarily worked in the past month	
Day	174 (58.8%)

Swing	80 (27.0%)
Night	42 (14.2%)
Average hours worked per week, in the past month (Mean ± SD) [Min, Max]	44.4 ± 7.78 [10, 80]
Perceived stress (PSS-4 Short Form) [15] (Mean± SD) [Min, Max]	9.33 ± 2.71 [4, 18]

*Percentages add up to more than 100% since participants were asked to select all that applied.

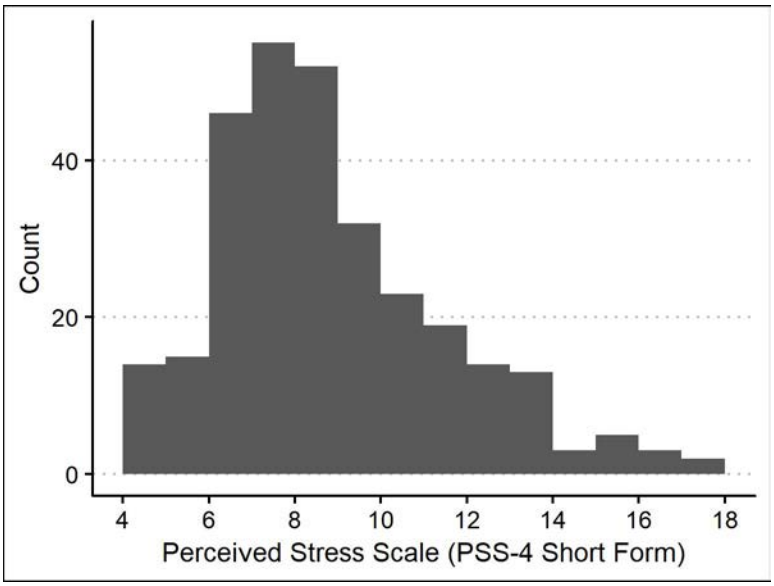

Figure 1. Distribution of Perceived Stress Scale (PSS-4 Short Form) [15] at baseline.

Table 2. Unadjusted associations between perceived stress in the past month and occupational related constructs, demographics, and work history at baseline

	Estimate (95% CI)	P-value
Occupational related constructs		
Job specific stress		
Work-related stress	1.34 (1.02, 1.66)	< 0.001
Work overload	0.75 (0.41, 1.08)	< 0.001
Environmental		
Environmental safety/dangerousness	1.00 (0.57, 1.43)	< 0.001
Possibility of conflict[†]	0.83 (0.48,1.18)	< 0.001
Experienced violence, during the past six months		
Less than once a month or more	*1.00 (ref)*	
Once a month or more	0.97 (0.29, 1.65)	0.01
Witnessed violence, during the past six months		
Less than once a month or more	*1.00 (ref)*	
Once a month or more	0.62 (-0.02, 1.25)	0.06
Organizational		
Organizational stressors[†]	0.92 (0.62,1.22)	< 0.001
Operational stressors	1.27 (0.98, 1.57)	< 0.001
Resource insufficiency	0.83 (0.55, 1.10)	< 0.001
Procedural justice	1.28 (0.83, 1.73)	< 0.001
Organizational support	1.08 (0.69, 1.47)	< 0.001
Work relationships		
Supervisor support[†]	0.84 (0.50,1.17)	< 0.001
Co-worker support	0.98 (0.55, 1.40)	< 0.001
Job contentment		

Job satisfaction	-1.31 (-1.67, -0.96)	< 0.001
Intentions to quit	0.76 (0.50, 1.03)	< 0.001
Outside of work		
Public image	0.93 (0.53, 1.33)	< 0.001
Demographics		
Age (years)	-0.05 (-0.07, -0.02)	< 0.001
Gender		
Female	*1.00 (ref)*	
Male	0.07 (-0.57, 0.70)	0.84
Race		
Other (non-white or more than one race)	*1.00 (ref)*	
Non-Hispanic white	-0.49 (-1.25, 0.26)	0.20
Education[†]		
High school/GED or some college	*1.00 (ref)*	
Two-year college degree (Associate's degree)	0.46 (-0.35,1.27)	0.26
Four-year college degree (Bachelor's degree)	-0.54 (-1.25,0.17)	0.14
Relationship status		
Not married or otherwise partnered	*1.00 (ref)*	
Married or otherwise partnered	-0.76 (-1.43, -0.10)	0.02
Military service *(ever active duty in U.S. Armed forces)*		
No	*1.00 (ref)*	
Yes	0.43 (-0.28, 1.14)	0.24
Work history		
Time at current facility (years)	-0.02 (-0.07, 0.02)	0.31
Adults in Custody (AIC's) security level, primarily worked with in the past month		
Minimum	*1.00 (ref)*	

Medium	0.54 (-0.44, 1.52)	0.28
Maximum	0.71 (-0.33, 1.76)	0.18
Post, primarily worked in the past month		
Non-housing unit	*1.00 (ref)*	
General population housing unit	0.56 (-0.13, 1.25)	0.11
Special housing/segregation unit	0.70 (-0.21, 1.61)	0.13
Shift, primarily worked in the past month		
Day	*1.00 (ref)*	
Swing	0.52 (-0.22, 1.27)	0.16
Night	0.34 (-0.58, 1.25)	0.47
Average hours worked per week, in the past month	0.05 (0.01, 0.09)	0.02

Note: Estimates are coefficients from linear mixed effects regression models with the Perceived Stress Scale (PSS-4 Short Form) [15] as the dependent variable and random effect for correctional facility (n=296), including the associated P-value.

[†]Excluded in the final model building for perceived stress due to strong relationship with other variables in the model.

Table 3. Occupational, demographic and work history associations with perceived stress in the past month among corrections professionals at baseline.

	Estimate (95% CI)	Standardized estimate* (95% CI)	P-value
Work-related stress	0.50 (0.08, 0.93)	0.43 (0.07, 0.80)	0.02
Average hours worked per week, in the past month	0.04 (0.00, 0.08)	0.31 (0.04, 0.59)	0.03
Operational stressors	0.60 (0.23, 0.98)	0.57 (0.22, 0.92)	0.002
Lack of procedural justice	0.48 (0.05, 0.92)	0.32 (0.03, 0.61)	0.03
Job satisfaction	-0.72 (-1.1, -0.35)	-0.58 (-0.87, -0.28)	< 0.001
Relationship status			
Not married/ otherwise partnered	*1.00 (ref)*	*1.00 (ref)*	
Married/ otherwise partnered	-0.58 (-1.15, -0.01)	-0.58 (-1.15, -0.01)	0.05
Time employed at current facility, years	-0.04 (-0.08, 0.00)	-0.25 (-0.52, 0.01)	0.06

* (Estimate – mean) / standard deviation

Note: Estimates are coefficients from a linear mixed effects regression model of the Perceived Stress Scale (PSS-4 Short Form) with a random effect for correctional facility. (n=296).

Table 4. Corrections professionals' demographics and work history at follow-up (n=128).

	n (%)
Age, years (Mean ± SD) [Min, Max]	45.5 ± 11.1 [25, 75]
Gender	
Female	44 (34.4%)
Male	84 (65.6%)
Race	
White (Non-Hispanic)	102 (79.7%)
Hispanic/Latino	7 (5.5%)
Native American/Native Alaskan	1 (0.8%)
Black/African American	5 (3.9%)
Asian	3 (2.3%)
Native Hawaiian/Other Pacific Islander	0 (0%)
More than one race	10 (7.8%)
Education	
High school/GED or some college	62 (48.4%)
Two-year college degree (Associate's)	21 (16.4%)
Four-year college degree (Bachelor's) or more	45 (35.2%)
Relationship status	
Not married or otherwise partnered	34 (26.6%)
Married or otherwise partnered	94 (73.4%)
Military service *(ever active duty in U.S. Armed forces)*	
No	103 (80.5%)
Yes	25 (19.5%)
Time employed at current facility, years (Mean ± SD) [Min, Max]	9.75 ± 6.91 [0.08, 30.4]
Security level of Adults in Custody (AIC's), primarily worked with in the past month	
Minimum	26 (20.3%)
Medium	71 (55.5%)
Maximum	31 (24.2%)
Post, primarily worked in the past month	
Non-housing unit	50 (39.1%)
General population housing unit	60 (46.9%)
Special housing/segregation unit	18 (14.1%)
Shift, primarily worked in the past month	
Day	84 (65.6%)

Swing	29 (22.7%)
Night	15 (11.7%)
Average hours worked per week, in the past month (Mean ± SD) [Min, Max]	45.1 ± 14.3 [8, 160]
Coronavirus (COVID-19) total exposure	2.33 ± 1.18 [0, 4]
COVID-19 total life effect	1.02 ± 0.51 [0, 2.63]
Perceived stress (PSS-4 Short Form) [15] (Mean± SD) [Min, Max]	9.30 ± 2.75 [4, 18]

Table 5. Unadjusted associations between perceived stress in the past month and coronavirus (COVID-19) and occupational related constructs as well as demographics and work history at follow-up.

	Estimate (95% CI)	P-value
Coronavirus (COVID-19) constructs		
Total COVID-19 exposure	0.8 (0.42,1.19)	< 0.001
Average COVID-19 life effect	1.84 (0.94,2.73)	< 0.001
Occupational related constructs		
Job specific stress		
Work-related stress	1.48 (1.04,1.91)	< 0.001
Work overload	0.49 (0.02,0.95)	0.04
Environmental		
Environmental safety/dangerousness	0.6 (-0.07,1.28)	0.08
Possibility of conflict[†]	0.42 (-0.08,0.92)	0.10
Experienced violence, during the past six months		
Less than once a month or more	*1.00 (ref)*	
Once a month or more	-0.24 (-1.43,0.94)	0.69
Witnessed violence, during the past six months		
Less than once a month or more	*1.00 (ref)*	
Once a month or more	0.56 (-0.42,1.55)	0.26
Organizational		
Organizational stressors[†]	1.35 (0.92,1.78)	< 0.001
Operational stressors	1.24 (0.8,1.67)	< 0.001
Resource insufficiency	0.84 (0.46,1.23)	< 0.001
Lack of procedural justice	1.15 (0.47,1.83)	0.001
Organizational support	1.01 (0.42,1.59)	< 0.001
Work relationships		

Supervisor support[†]	0.88 (0.38,1.38)	< 0.001
Co-worker support	0.84 (0.22,1.46)	0.008
Job contentment		
Job satisfaction	-0.53 (-1.08,0.02)	0.06
Intentions to quit	0.82 (0.47,1.16)	< 0.001
Outside of work		
Public image	0.38 (-0.26,1.02)	0.24
Demographics		
Age (years)	-0.08 (-0.13,-0.04)	< 0.001
Gender		
Female	*1.00 (ref)*	
Male	-0.67 (-1.68,0.33)	0.19
Race		
Non-white or more than one race	*1.00 (ref)*	
White (Non-Hispanic)	0.22 (-0.98,1.42)	0.72
Education[†]		
High school/GED or some college	*1.00 (ref)*	
Two-year college degree (Associate's degree)	0.7 (-0.67,2.08)	0.31
Four-year college degree (Bachelor's degree)	0.34 (-0.73,1.41)	0.53
Relationship status		
Not married or otherwise partnered	*1.00 (ref)*	
Married or otherwise partnered	-0.14 (-1.23,0.96)	0.80
Military service *(ever active duty in U.S. Armed forces)*		
No	*1.00 (ref)*	
Yes	-0.22 (-1.43,1)	0.73
Work history		

Time at current facility (years)	-0.07 (-0.13,0)	0.06
Adults in Custody (AIC's) security level, primarily worked with in the past month		
Minimum	*1.00 (ref)*	
Medium	0.37 (-0.88,1.63)	0.56
Maximum	0.72 (-0.73,2.17)	0.33
Post, primarily worked in the past month		
Non-housing unit	*1.00 (ref)*	
General population housing unit	-1.3 (-2.33,-0.28)	0.01
Special housing/segregation unit	-0.75 (-2.22,0.72)	0.32
Shift, primarily worked in the past month		
Day	*1.00 (ref)*	
Swing	-0.13 (-1.31,1.05)	0.82
Night	0.59 (-0.94,2.12)	0.45
Average hours worked per week, in the past month	-0.01 (-0.05,0.02)	0.47

Note: Estimates are coefficients from linear mixed effects regression models with the Perceived Stress Scale (PSS-4 Short Form) [15] as the dependent variable and random effect for correctional facility (n=128), including the associated P-value.

[†]Excluded in the final model building for perceived stress due to strong relationship with other variables in the model.

Table 6. Significant coronavirus (COVID-19), occupational, demographic and work history associations with perceived stress in the past month among corrections professionals at follow-up.

	Estimate (95% CI)	Standardized estimate* (95% CI)	P-value
Work-related stress	1.53 (0.84, 2.21)	1.43 (0.79, 2.06)	<0.001
Work overload	-0.87 (-1.32, -0.41)	-0.86 (-1.32, -0.41)	<0.001
Post, primarily worked in the past month			
Non-housing unit	*1.00 (ref)*	*1.00 (ref)*	
General population unit	-1.26 (-2.11, -0.42)	-1.26 (-2.11, -0.42)	0.004
Special housing/ segregation unit	-1.70 (-2.93, -0.48)	-1.70 (-2.93, -0.48)	0.007
Job satisfaction	0.76 (0.21, 1.31)	0.63 (0.17, 1.09)	0.007
Total COVID-19 exposure	0.54 (0.12, 0.96)	0.63 (0.14, 1.12)	0.01
Age (years)	-0.05 (-0.09, -0.01)	-0.55 (-1.00,-0.1)	0.02
Co-worker support	0.63 (0.06, 1.2)	0.47 (0.05, 0.90)	0.03
Intentions to quit	0.39 (0.03, 0.75)	0.49 (0.04, 0.93)	0.03

* (Estimate – mean) / standard deviation

Note: Estimates are significant ($p > 0.05$) coefficients from a linear mixed effects regression model of the Perceived Stress Scale (PSS-4 Short Form) with a random effect for correctional facility (n=128), while correcting for gender, race, shift, adults in custody (AIC) security level, time at current facility, average COVID-19 life effect, experienced and witnessed violence, environmental safety/ dangerousness, organizational support, resource insufficiency, lack of procedural justice, operational stressors, and public image.

Supplemental Table 1. Coronavirus (COVID-19), occupational, demographic and work history associations with perceived stress in the past month among corrections professionals at follow-up.

	Estimate (95% CI)	Standardized estimate* (95% CI)	P-value
Work-related stress	1.53 (0.84, 2.21)	1.43 (0.79, 2.06)	<0.001
Work overload	-0.87 (-1.32, -0.41)	-0.86 (-1.32, -0.41)	<0.001
Post, primarily worked in the past month			
Non-housing unit	*1.00 (ref)*	*1.00 (ref)*	
General population unit	-1.26 (-2.11, -0.42)	-1.26 (-2.11, -0.42)	0.004
Special housing/ segregation unit	-1.70 (-2.93, -0.48)	-1.70 (-2.93, -0.48)	0.007
Job satisfaction	0.76 (0.21,1.31)	0.63 (0.17, 1.09)	0.007
Total COVID-19 exposure	0.54 (0.12, 0.96)	0.63 (0.14, 1.12)	0.01
Age (years)	-0.05 (-0.09, -0.01)	-0.55 (-1.0,- 0.1)	0.02
Co-worker support	0.63 (0.06, 1.2)	0.47 (0.05, 0.9)	0.03
Intentions to quit	0.39 (0.03, 0.75)	0.49 (0.04, 0.93)	0.03
Public image	-0.57 (-1.16, 0.03)	-0.42 (-0.86, 0.02)	0.06
Experienced violence, during the past six months			
Less than once a month or more	*1.00 (ref)*	*1.00 (ref)*	
Once a month or more	-1.01 (-2.14, 0.11)	-1.01 (-2.14, 0.11)	0.08
Shift, primarily worked in the past month			
Day	*1.00 (ref)*	*1.00 (ref)*	
Swing	-0.7 (-1.6, 0.21)	-0.7 (-1.6, 0.21)	0.13
Night	-0.36 (-1.53, 0.82)	-0.36 (-1.53, 0.82)	0.55
Organizational support	0.55 (-0.28, 1.38)	0.45 (-0.23, 1.13)	0.19
Resource insufficiency	0.34 (-0.19, 0.87)	0.40 (-0.23, 1.02)	0.21
Gender			
Female	*1.00 (ref)*	*1.00 (ref)*	
Male	-0.46 (-1.23, 0.31)	-0.46 (-1.23, 0.31)	0.24
Race			
Non-white or more than one race	*1.00 (ref)*	*1.00 (ref)*	
White (Non-Hispanic)	-0.5 (-1.45, 0.45)	-0.50 (-1.45,0.45)	0.3
Environmental safety/dangerousness	-0.33 (-1.04, 0.37)	-0.25 (-0.77, 0.27)	0.35
Lack of procedural justice	-0.37 (-1.18, 0.44)	-0.26 (-0.83, 0.31)	0.36
Operational stressors	0.28 (-0.40, 0.96)	0.28 (-0.4, 0.95)	0.42
Time at current facility (years)	-0.02 (-0.09, 0.04)	-0.17 (-0.61, 0.27)	0.45
Witnessed violence, during the past six months			

Less than once a month or more	*1.00 (ref)*	*1.00 (ref)*	
Once a month or more	0.36 (-0.63, 1.36)	0.36 (-0.63, 1.36)	0.47
COVID-19 life effect	0.16 (-0.68, 1.00)	0.08 (-0.34, 0.50)	0.71
Adults in Custody (AIC's) security level, primarily worked with in the past month			
Minimum	*1.00 (ref)*	*1.00 (ref)*	
Medium	-0.07 (-1.63, 1.50)	-0.07 (-1.63, 1.50)	0.93
Maximum	-0.09 (-1.83, 1.65)	-0.09 (-1.83, 1.65)	0.92

* (Estimate – mean) / standard deviation

Note: Estimates are coefficients from a the full linear mixed effects regression model of the Perceived Stress Scale (PSS-4 Short Form) with a random effect for correctional facility. (n=128).

Table 7. Brain activation during Stroop task. Brain activation between high and low stress groups during the contrast of the incongruent and neutral word blocks. Peak z score is presented. Tailarach coordinates. R = right. L = left. Voxel level significance of $p < 0.05$, uncorrected. Only clusters ≥ 200 voxels are presented for ease of interpretation.

Region	BA	Voxels	*z*	x	y	z
Incongruent > Neutral						
High Stress > Low Stress						
L Medial Frontal Gyrus/ R Middle Frontal Gyrus	9	519	2.57	-1	53	45
Low Stress > High Stress						
Putamen	--	238	4.03	27	-7	11

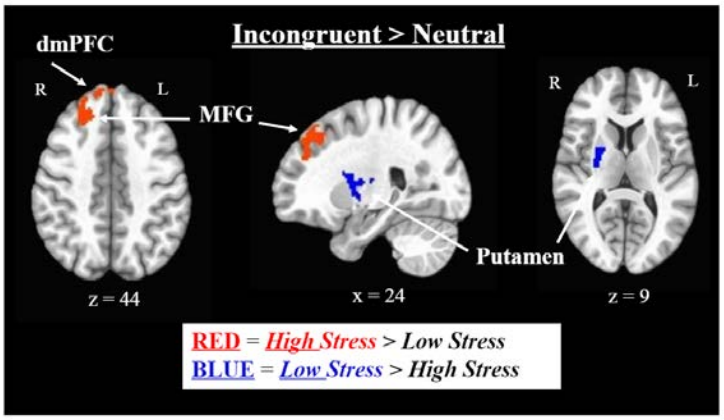

Figure 2. The high stress group of corrections professionals show greater activation compared to the low stress group in right middle frontal gyrus to the blocks of incongruent trials than the neutral trial.

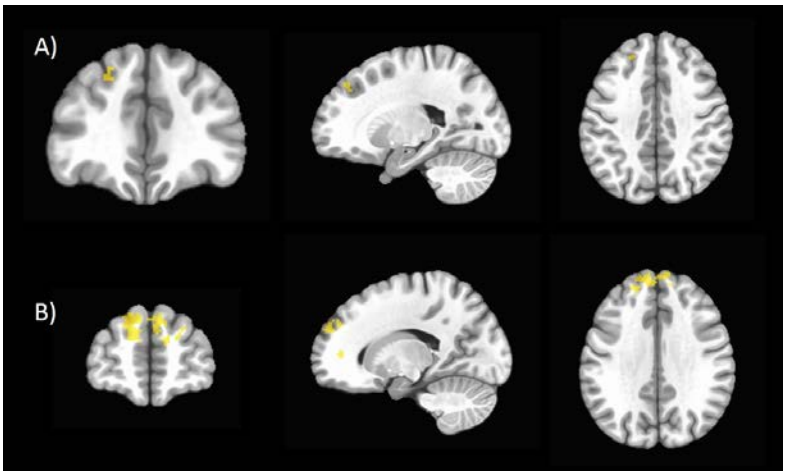

Figure 3. Greater activation (yellow) in the right dorsolateral prefrontal cortex (A) and bilateral middle frontal gyrus by the high stress than low stress group during the Incongruent than Neutral blocks. Right and left reversed in images.