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The accumulated impact of direct and indirect workplace violence exposure on mental health and physiological activity among correctional officers☆

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ABSTRACT

Correctional officers are differentially exposed to workplace violence, but little is known about how both direct and indirect exposure may impact officers. The current study examines differences in the impact of direct (i.e., being the primary target of assault) and indirect (i.e., responding to a violent incident) violence exposure on stress responsivity and mental health problems in a sample of correctional officers from Minnesota ($N = 488$). Greater accumulation of direct assault exposures increased the overall incidence of mental health problems but was not associated with changes in stress responsivity measured via salivary biomarkers. Alternatively, the accumulation of indirect assault exposures did not increase the prevalence of mental health problems but was associated with subsequent changes in cortisol. These results indicate that the stress-related consequences of assault exposure vary based on officers' exposure type. Future programming should target both direct and indirect violence exposures to mitigate negative, stress-related outcomes, including mental health problems.

1. Introduction

While prison populations have been decreasing in recent years (Carson, 2022), the overall demand for correctional officers remains high (COs; Maruschak & Buehler, 2021). Despite this demand, many states and jurisdictions are experiencing massive CO shortages (Santo & Neff, 2020), resulting in institutions that are less safe and that rely on more punitive institutional policies (Blakinger, Lartey, Schwartzapfel, Sisak, & Thompson, 2021). While the fundamental causes of the recent difficulty in hiring and retaining COs remains unknown, some have speculated that the demands of the job coupled with the increased likelihood of experiencing occupational violence may be a significant contributing factor (Prison Policy Initiative, 2022). These concerns are warranted, as COs experience a unique work environment and are significantly more likely than those in other occupations to experience workplace violence and nonfatal injury (U.S. Bureau of Labor Statistics, 2023).

COs also experience increased levels of a wide range of deleterious stress-related outcomes (Schwartz, Granger, Calvi, Jodis, & Steiner, 2023), including mental health problems (Regehr et al., 2019; Spinaris, Denhof, & Kellaway, 2012). Specifically, COs are at an increased risk of developing post-traumatic stress disorder (PTSD; Carleton et al., 2020; Jaegers et al., 2022; Johnston, Ricciardelli, & McKendy, 2022; St. Louis, Frost, Monteiro, & Trapassi Migliaccio, 2023), depression (Jaegers et al., 2021; Ricciardelli, McKendy, Jamshidi, & Carleton, 2022; St. Louis et al., 2023), and anxiety (Ricciardelli et al., 2022; St. Louis et al., 2023). These issues can be partially attributed to chronic exposure to the workplace stressors, including violence (Schaufeli & Peeters, 2000). One way that chronic stressor exposure culminates into these stress-related deleterious outcomes is through the repeated and prolonged activation of specific physiological systems that comprise the larger stress response system, including the sympathetic nervous system (SNS) and the hypothalamic-pituitary-adrenal (HPA) axis (McEwen & Seeman, 1999). Prolonged activation of one or both systems has been tied to a wide range of negative outcomes, including mental health problems (Adam et al., 2017). Despite these observations, little is known regarding how and under what circumstances exposure to workplace violence contributes to such issues, with a particular lack of attention attributed to

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mental health outcomes (Steiner & Cain, 2016).

For example, previous research tends to capture violence exposure as a singular, insulated event where officers are asked to report whether they directly experienced a violent incident, such as an assault (Jaegers et al., 2022; Ricciardelli, Power, & Medeiros, 2018). This approach is limited since violent incidents and their influence are not simply and neatly confined to the singular interaction in which the incident occurred. Rather, violent incidents may also *indirectly* influence other officers, staff, and incarcerated individuals that are organized within the larger prison system (for recent and notable examples, see Ellison & Jaegers, 2022; St. Louis et al., 2023). Officers who did not directly experience a violent incident may become aware of the incident for multiple reasons. They may witness an assault of a fellow CO (Ellison, Cain, & Jaegers, 2022; Ellison & Jaegers, 2022; St. Louis et al., 2023), respond to provide backup, be informed of it during a briefing, or news of the event may pass through officer communication networks. In any case, these indirect exposures, alongside direct exposures, are expected to further contribute to the development of stress-related issues, including mental health problems (Ellison et al., 2022; Ellison & Jaegers, 2022; Finney, Stergiopoulos, Hensel, Bonato, & Dewa, 2013).

Making use of a sample of COs from the Minnesota Department of Corrections (MnDOC), the current study examines the impact of the accumulation of (in)direct exposures to officer involved assaults—a salient, severe, and pervasive source of violence (Ricciardelli et al., 2018)—using administrative disciplinary data supplemented with narratives written by responding officers to determine officers' involvement in each incident. Since exposure to violence is expected to result in deleterious outcomes, like mental health problems via increased levels of stress and stress responsivity (Adam et al., 2017), we also examine the impact of (in)direct assault exposures in two ways. First, relying on salivary biomarkers, we examine the impact of increased accumulation of (in)direct assaults on activity in two physiological systems organized within the larger stress response system—the HPA axis and the SNS. Second, we examine the potential impact of accumulated (in)direct exposures on three mental health disorders commonly experienced by COs: 1) PTSD; 2) depression; and 3) anxiety.

2. Direct and indirect violence exposure

While few studies have examined the potential differential impact of direct and indirect exposure to occupational violence among COs (but see Luthra et al., 2009; St. Louis et al., 2023), there is a substantive literature documenting the consequences of direct exposures. For example, Steiner and Wooldredge (2015) found COs who experienced a greater number of assaults were more likely to report higher levels of workplace stress. In addition to COs (Frost & Monteiro, 2020; Jaegers et al., 2022; Ricciardelli et al., 2018), other first responders such as police officers, firefighters, and emergency medical service personnel have been found to be more likely to suffer from symptoms of PTSD, depression, and alcohol abuse following exposure to violent events. These populations also report higher self-appraised stress levels and exhibit increased activity within the HPA axis and SNS among others (Austin-Ketch et al., 2012; Lammers-van der Holst & Kerkhof, 2015). Collectively, these findings provide evidence of the impact of direct violence exposures on increased stress responsivity and subsequent mental health problems.

In addition to the consequences of direct exposure to violence, previous research has also noted the potential deleterious effects of indirect exposures. Perhaps the most salient concept within this context is *psychological stress*, which refers to situations in which an individual does not directly encounter an environmental stressor, but a physiological stress response is still triggered (Sapolsky, 2004). Psychological stressors are likely to be pervasive among COs, as gaining and passing knowledge pertaining to violent incidents is an essential component of the job and required for maintaining order and safety within prisons (Bottoms, 1999). Further, previous research has demonstrated that being informed of a violent incident, an indirect source of exposure, may result in increased levels of fear, anxiety, and hypervigilance among COs (Luthra et al., 2009). For example, in a recent study, St. Louis et al. (2023) reported that officers who reported personally knowing other officers who died by suicide at any point during their career were significantly more likely to experience greater levels of anger, anxiety, depression, and PTSD. Previous studies have also found that COs who are threatened while on shift are more likely to experience increased stress levels (Steiner & Wooldredge, 2015) and PTSD symptoms (Ellison & Jaegers, 2022). Specifically, Ellison and Jaegers (2022) found, within jail settings, that direct violence exposures, such as assaults, and indirect exposures, such as threats and witnessing staff assaults, were each associated with increased PTSD symptoms among COs. While jails and prisons are not identical environments, these findings, collectively, point to the importance of considering both direct and indirect exposures.

3. Stress response and mental health

Stress responsivity refers to the collective physiological responses organized by the stress response system and triggered when a stressor (external or psychological) is encountered. The primary purpose of the resulting stress responses are to prime an individual to overcome the encountered stressor (Sapolsky, 2004). In this way, stress responses are largely adaptive, but are better aligned with overcoming short-term or acute stressors. Alternatively, long-term or chronic stressors can result in the prolonged activation of the stress response system and result in a wide array of deleterious effects, including various mental health problems (Adam et al., 2017). As mentioned previously, two major branches of the stress response system are the HPA axis and the SNS. The HPA axis is responsible for regulating a variety of hormones throughout the body as well as stress recovery. The primary product of the HPA axis is cortisol, a glucocorticoid and one of the more well-known stress hormones. Cortisol levels are frequently used to capture HPA axis activity (Hellhammer, Wüst, & Kudielka, 2009). The SNS is one of the two branches of the autonomic nervous system (ANS), and largely responsible for upregulating physiological responses immediately following stressor exposure. While several biomarkers can be used to assess SNS activity, salivary alpha-amylase (sAA) has become increasingly popular for at least two reasons. First, studies have indicated that sAA is a valid and reliable indicator of SNS activity and is highly correlated with other indicators (Granger, Kivlighan, El-Sheikh, Gordis, & Stroud, 2007). Second, sAA is a noninvasive marker of SNS activity, as it can be collected without the use of blood draws or large medical devices (e.g., electrocardiogram).

The prolonged activation of the stress response system has been previously recognized as an important underlying mechanism linking (in)direct stressor exposure with mental health problems (Adam et al., 2017). Prolonged activation of physiological systems like the HPA axis and SNS have been linked to decreased volume, atrophy, and neuronal death in the hippocampus and anterior cingulate cortex (Sapolsky, 2000). Reduced volume in these specific brain regions has also been linked to a host of mental health problems including PTSD, depression, and increased anxiety (Campbell & MacQueen, 2004; Shin, Rauch, & Pitman, 2006).

Despite these findings, the associations between (in)direct exposure to occupational stressors commonly experienced by COs and physiological activity remains insufficiently investigated (for a recent state-of-the-art review on the topic see Schwartz et al., 2023). Previous research has examined similar trends in other populations that are commonly exposed to trauma and violence. Nurses with increased HPA axis activity (as evidenced by heighted cortisol levels) display difficulty in completing work tasks (Lin, Jen, Lin, Seo, & Chang, 2022) and emergency dispatchers with increased HPA activity levels reported experiencing more job-related stress than controls (Weibel, Gabrion, Aussedat, & Kreutz, 2003). Among other law enforcement officers, police with heightened cortisol levels were more likely to be diagnosed with PTSD (Austin-Ketch et al., 2012) and novice police officers with increased HPA axis activity were more likely to leave the force over time (Lammers & Kerkhof, 2015). Similar patterns have also been observed for indirect exposures to violence, wherein emergency dispatchers, who do not directly see or respond to violence, are still more likely to suffer subclinical PTSD and burnout (Klimley, Van Hasselt, & Stripling, 2018), nightmares, flashbacks (Adams, Shakespeare-Finch, & Armstrong, 2015), and anger outbursts. Further, emergency dispatchers who report more stress exposures at work have significantly higher cortisol levels compared to controls (Weibel et al., 2003). Taken together, these findings suggest that while the magnitude of their impact may differ, both direct and indirect exposures to violence among COs can be expected to result in differential patterns of physiological arousal, particularly within the HPA axis and the SNS.

4. The current study

The current study aims to advance the existing literature in three ways. First, drawing from a combination of official records and critical incident report narratives, we distinguish between direct and indirect exposures to officer involved assaults during a specified and proximate recall period. The use of official records should limit recall bias that may be more prevalent in self-reported measures of assault exposures. Further, the use of a specified and proximate recall period more effectively localizes the potential impact of accumulated assault exposure, providing greater insight into the ways that more recently experienced assault exposures—as opposed to those that may have occurred years or even decades ago—impact stress related outcomes. In these ways, the current study aims to build upon and further explore the results reported by St. Louis et al. (2023) who relied on self-reported, lifetime measures of (in)direct assault exposures (among other stressors). The current study is focused on the impact of accumulated officer involved assault exposures, as COs have previously indicated in qualitative studies that such incidents are salient and severe events (Ricciardelli et al., 2018). Further, assaults also likely require a nontrivial number of responding officers who witness the incident and its consequences firsthand and share that knowledge with other officers.

Second, we examine the potential impact of accumulated (in)direct assault exposure on two salivary biomarkers related to physiological activity in two key branches of the stress response system, the HPA axis and the SNS. Given the key role of stress physiology in the overall association between stress exposure and mental health problems (Adam et al., 2017), we offer the following hypotheses:

H1. : Both direct and indirect exposures to assaults will be associated with increased HPA axis and SNS activity, reflected as increased average levels of cortisol and sAA.

H2. : The magnitude of the effect for direct exposures will be greater than indirect exposures.

Third and finally, we examine the impact of the accumulation of (in) direct assault exposures on mental health problems. Based on the results from previous studies examining (in)direct exposures, we offer the following hypotheses:

H3. : Direct and indirect assault exposures are expected to result in increased levels of mental health problems.

H4. : Greater accumulation of direct exposures is expected to result in a greater prevalence of mental health problems relative to a similar accumulation of indirect exposures.

5. Methods

5.1. Data

Data for this study were collected from COs currently working at three different correctional facilities within the Minnesota Department of Corrections (MnDOC). The three facilities were selected in collaboration with MnDOC to provide a representative sample of all facilities in the statewide correctional system. The first facility is the largest close-security institution in the state for men and houses approximately 1600 incarcerated individuals. The second facility is a medium-security facility and the largest in the MnDOC system, housing approximately 2000 men. The third facility houses approximately 650 females at all security levels. The study employed a two-cohort, longitudinal design, in which three data collection periods spaced approximately six months apart were completed for each cohort.[1] The first data collection period was completed in July 2018 (time 1, wave 1), with subsequent data collection periods completed in January 2019 (time 2, wave 1 and time 2, wave 2), July 2019 (time 3, wave 2 and time 3, wave 3), and January 2020 (time 4, wave 3). Fig. 1 provides a more detailed summary of the overall study timeline, including data collection periods for each cohort and the key study occasion examined in the current study. A total of 488 officers were recruited across the three sites at wave 1, constituting a response rate of approximately 69%[2] and a retention rate that exceeded 70%. Wave 1 of data collection included a self-reported survey instrument with items tapping a wide range of topics including perceptions of workplace danger and self-reported symptoms of mental health problems. A similar survey instrument was administered again at wave 3, with a shortened instrument administered at wave 2.

Participating officers provided two saliva samples at each wave of data collection, one at the beginning and one at the end of the same shift. Officers were asked to refrain from eating or drinking for at least 10 min prior to providing each sample. Saliva was collected via passive drool and samples were stored in portable freezers at −30 °C until transported to the laboratory, where they were stored at −80 °C until assayed. Samples were thawed and centrifuged at 3000 rotations per minute for 15 min to remove mucus (Granger et al., 2007). Assays were performed using commercially available kits from Salimetrics without modification and performed in duplicate with all resulting intra-assay (cortisol = 3.70%; sAA = 3.93%) and inter-assay (cortisol = 2.55%; sAA = 2.96%) coefficients of variation below the recommended cut point of 5% (Ryff & Almeida, 2009).

In addition to self-report instruments and salivary data collection, information pertaining to critical incident exposure was collected using two sources. First, data for all disciplinary incidents that occurred within the study facilities was provided by MnDOC. This information included details pertaining to each incident including the date and time they

[1] The two-cohort design was a direct result of a critical incident that occurred at the second study site during wave 1 of data collection but before the first day of data collection at that facility. At the time of the incident, data collection had started at the other two sites and was allowed to be carried out to completion for the first wave of data collection. In order to retain the second study site in the study site, wave 1 data collection was postponed requiring a fourth collection period (specified in Figure 1). In an effort to ensure that the two cohorts did not systematically vary in ways that may impact the examined hypotheses, supplemental analyses that included a dummy indicator variable for each cohort were estimated.

[2] The overall response rate for site 1 was 68% (204 respondents out of 300 total possible), 72.26% for site 2 (211 out of 292 total), and 77.48% for site 3 (86 out of 111 total). Cohort #1 consisted of respondents from sites 1 and 3 (70.56%; 290 participants out of 490 total possible). Cohort #2 consisted only of respondents from site 2 (72.26%; 211 out of 292 total possible). In total, 488 officers, out of the 703 eligible for inclusion, participated in the study resulting in a response rate of 69.42%. The cohort data collection structure and periods are displayed in Figure 1.

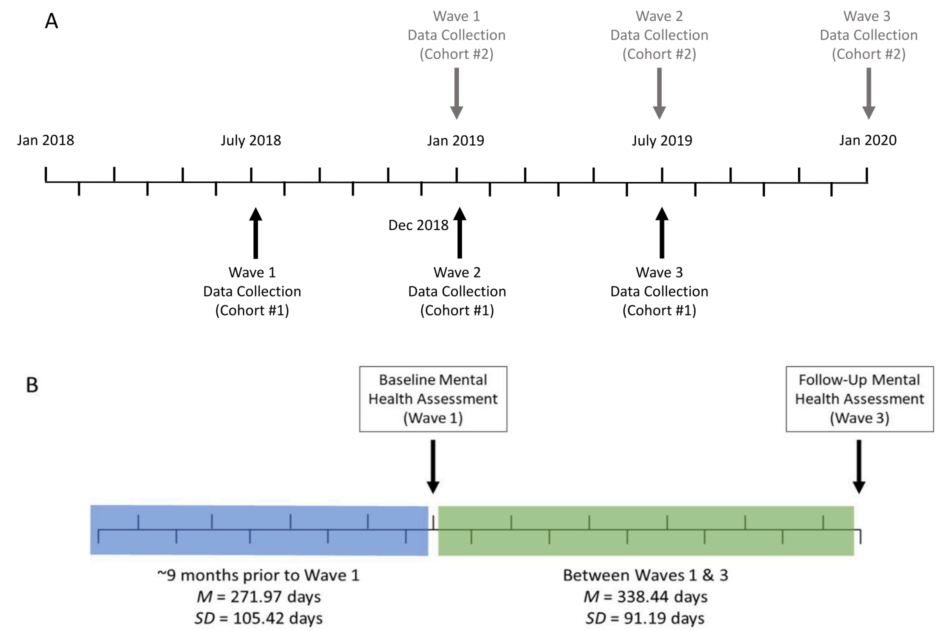

Fig. 1. Study measurement occasions.
Panel A: Presents the full study timeline with all data collection periods. The black arrows represent data collection periods for Cohort #1, and the gray arrows on top represent data collection periods for Cohort #2. Panel B: The blue section of the timeline represents the critical incident assessment period that occurred prior to wave 1 and is the focal exposure period for the current study. The blue section ends the day before the baseline mental health assessment at wave 1 was completed. The green section of the timeline represents the 12 months between the completion of each participant's wave 1 and wave 3 surveys but does not include the days in which the surveys were completed. The green section was not the focus of the current study but is presented for context and to provide a more detailed description of the overall study design. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

occurred, locations, type of violation, and the officers that were involved. Second, disciplinary data was supplemented narrative reports written by responding officers. These reports provided a better understanding of the context surrounding each incident and each of the responding officers' level of involvement. Narratives were coded by trained research team members with greater than 90% agreement between coders. In total, 66,766 infractions were coded for 7381 unique incidents. Critical incident data was provided for the full study period (between July 2018 and January 2020) as well as for approximately nine months (approximately 272 days) prior to the first wave of data collection.[3] To preserve temporal order and to minimize missing data, the current study will rely on critical incident data from this period prior to wave 1 along with self-report and salivary biomarker data from wave 1. All data collection procedures were approved by the Institutional Review Board at the University of Nebraska Medical Center.

6. Measures

6.1. Assault exposure

Officer Involved Assault Exposure. Critical incident data allowed for the identification of officers who were involved in an assault. That is, all officers named in the disciplinary data for an officer involved assault were identified as having some level of involvement. MnDOC defines assaults as "an act, threat, or attempt to inflict offensive physical contact or bodily harm on a person that puts the person in immediate danger" (Minnesota Department of Corrections, 2021). In this way, assaults are defined in a way that closely resembles other key measures of crime outside of prisons, including the National Incident Based Reporting System (NIBRS; Federal Bureau of Investigation, Criminal Justice Information Services Division, 2012). Directly in line with this definition, acts that involved the use of a weapon on staff, violence that resulted in bodily harm, throwing bodily fluids on or at staff, and sexual assaults involving staff were also considered assaults.

Narratives were used to gain a better understanding of officers' overall level of involvement in each assault. More specifically, narratives were used to distinguish between officers who were the primary target of each assault and those officers who were exposed to the incident but not the primary target (e.g., witnessed the assault, responded to the incident, escorted incarcerated individuals away from the scene, reviewed video footage after the fact to finalize a report). The use of official records allowed for the construction of a complete person-day datafile containing all officer involved assaults across the observation period. Two count variables were constructed tapping the total number of officer involved assaults each CO experienced in which they were: 1) the direct target of the assault; and 2) indirectly involved in the assault. The descriptive statistics for both measures are presented in Table 1, along with descriptive statistics for all other study variables. In the approximately nine months preceding wave 1, 16.19% of officers were the direct target of one or more assaults and 24.51% of officers indirectly experienced an assault. Approximately 71% of all officers included in the study did not directly or indirectly experience an assault and nearly 12% of officers were directly and indirectly involved in one or more assaults during this timeframe.

6.2. Mental health measures

Post-traumatic stress disorder (PTSD). PTSD was assessed at wave 1 using the PTSD Checklist for the Diagnostic and Statistical Manual Fifth Edition (DSM-V). This 20-item self-report instrument has been found to be valid and reliable (Blevins, Weathers, Davis, Witte, & Domino, 2015). Participants indicated the extent to which each symptom (e.g., unwanted memories of a stressful experience) bothered them in the past

[3] The observation period that preceded the study was intended to be a full 12 months, but due to the two-cohort design and the intensive burden compiling all of the narrative reports placed on MnDOC staff, the pre-study observation period was shorted to approximately nine months.

Table 1
Descriptive statistics for all study variables.

	Mean/%	SD/n	Min	Max
Salivary Biomarkers (mean)				
Cortisol (μg/dL)				
Start of Shift	0.300	0.338	0.037	6.105
End of Shift	0.101	0.092	0.014	0.965
Mean Cortisol	0.199	0.126	0.030	0.801
Alpha-Amylase (U/mL)				
Start of Shift	48.900	57.051	0.681	778.016
End of Shift	55.882	60.601	1.771	883.632
Mean Alpha-Amylase	50.648	39.651	1.226	204.370
Mental Health Measures (mean)				
PTSD	28.544	20.258	0.000	80.000
Depression	10.789	6.576	0.000	30.000
Anxiety	55.370	11.246	37.100	83.100
Staff Assault Measures (mean; weighted cumulative indices of exposure)				
Indirect Exposure	0.199	0.486	0.000	3.143
Direct Exposure	0.086	0.248	0.000	1.794
Controls				
Job Demands (mean)	11.180	2.133	4.000	16.000
Job Control (mean)	9.044	2.326	4.000	16.000
Role Ambiguity (mean)	8.778	2.556	4.000	16.000
Role Conflict (mean)	13.400	3.341	5.000	20.000
Service Time (mean)	9.499	7.557	0.083	30.750
Violence Outside Workplace (mean)	2.798	2.128	0.000	6.000
Shift (%)				
1st Watch	11.227%	54		
2nd Watch	40.956%	197		
3rd Watch	43.659%	210		
Other	4.158%	20		
Study Site (%)				
Site 1	41.060%	186		
Site 2	42.384%	192		
Site 3	16.556%	75		
Family Situation (%)				
Not married/no children	31.974%	149		
Married/no children	13.090%	61		
Married/children	40.987%	191		
Not married/children	13.948%	65		
Age (mean)	38.739	10.513	19	67
Sex (%)				
Female	30.621%	143		
Male	69.379%	324		
Race (%)				
White	88.248%	413		
African American	3.419%	16		
Latino(a)	3.419%	16		
Other	4.915%	23		

month on a five-point scale ranging from 0 (not bothered at all) to 4 (extremely bothered). Scores were summed to assess overall levels of PTSD ($\alpha = 0.96$). Individual measures of PTSD ranged between 0 and 80 with greater values indicating more PTSD symptoms.

Depression. Symptoms of depression were measured using the 10-item short form of the Center of Epidemiologic Studies-Depression Scale (CES-D; Radloff, 1977). Participants indicated how frequently they experienced 10 symptoms (e.g., I was bothered by things that don't normally bother me) in the past seven days. Provided response categories ranged from 1 (rarely/none) to 4 (all the time) with all responses summed ($\alpha = 0.88$) and resulting scores ranging from 0 to 30, with greater scores indicating greater levels depressive symptoms.

Anxiety. Anxiety symptoms were measured using the eight-item short-form version of the Patient Reported Outcomes Measurement Information System (PROMIS) Anxiety short-form (Cella et al., 2010). Participants were asked to report how frequently they experienced symptoms (e.g., my worries overwhelmed me) in the past seven days using five response categories ranging from 1 (never) to 5 (always). Responses were summed ($\alpha = 0.96$) and then converted to T-scores using the National Institutes of Health T-scores map.

6.3. Physiological activity measures[4]

Cortisol. Cortisol was measured in micrograms per deciliter (μg/dL) and assessed using two salivary samples collected at the beginning and end of one shift during wave 1. The collection of multiple samples was necessary, as cortisol fluctuates across the sleep-wake cycle, peaking shortly after waking and then gradually declining throughout the course of the day (Edwards, Evans, Hucklebridge, & Clow, 2001). Importantly, this measurement strategy was not aimed at assessing cortisol response to a specific event, but instead *was focused on capturing a broader daily snapshot of HPA axis activity*. To capture average cortisol levels during a given shift, the mean of both cortisol samples was calculated. To limit the possible influence of outliers, the resulting mean score was winsorized at +/− three standard deviations from the mean.[5]

Alpha-amylase. sAA also fluctuates across the sleep-wake cycle, but in an inverse pattern to cortisol, gradually increasing post-waking (Granger et al., 2007). Similar procedures were employed to assess average levels of sAA during the examined shift. More specifically, the mean of both measures (originally measured in units per milliliter, U/mL) was calculated with any resulting outliers winsorized at +/− three standard deviations from the mean.

6.4. Statistical covariates

To better isolate the impact of the direct and indirect exposure to officer involved assaults on the examined biomarkers and mental health outcomes, twelve statistical covariates were included in the estimated multivariable models. First, four self-reported measures tapping perceptions of job characteristics—job demands, job control, role ambiguity, and role conflict—were included to differentiate between the impact of assault exposure from other work-related stressors. Job demands was assessed using a four item index previously used to assess officers' perceptions of the safety and staffing of their workplace (Cullen, Link, Wolfe, & Frank, 1985; Lambert, Hogan, & Altheimer, 2010; Poole & Regoli, 1980). Officers were asked to report how much they agree with four statements with provided response categories ranging between 1 (strongly disagree) and 4 (strongly agree). Responses were summed ($\alpha = 0.70$) with higher scores on the resulting measure indicating greater perceived levels of job demands. Job control was assessed using a previously developed four item index tapping officers' perceptions of their ability to make decisions at work (Steiner & Wooldredge, 2015). Officers were asked to report the extent to which they agreed with each statement with responses ranging between 1 (strongly disagree) and 4 (strongly agree). Responses were summed ($\alpha = 0.73$) with greater scores on the resulting measure indicating increased perceptions of job control.

Role ambiguity was measured using a four-item index previously

[4] The natural fluctuation of the examined salivary biomarkers (i.e., cortisol and sAA) across the sleep-wake cycle prevents the employment of a diagnostic criteria or cut point to determine if any one individual's cortisol or sAA levels meet or exceed a typical or common level. Rather, the current study examines average daily levels of cortisol and sAA are examined in relation to the accumulated (in)direct exposure to subsequent officer involved assaults.

[5] To ensure that the results from the primary analysis were not sensitive to this measurement strategy, two sets of supplemental models were estimated. First, the mean cortisol and sAA measures were replaced with a delta score calculated by subtracting the beginning of shift measure from the end of shift measure. Second, all models were estimated in which the end of shift score was regressed on all of the examined independent variables (i.e., accumulated direct or indirect assault exposures and statistical covariates) along with the beginning of shift measure. The inclusion of the beginning of shift measure as a covariate accounts for any stability in the examined biomarker during the course of the examined shift, effectively isolating within-individual change. For both sets of supplemental models, all statistical covariates from the models from the primary analysis were also included. The overall pattern of results from both sets of supplemental models directly aligned with the primary analysis.

developed to assess officers' perceptions of the clarity of their roles and responsibilities (Şenol-Durak, Durak, & Gençöz, 2006). Responses to all four items were summed to create the role ambiguity index ($\alpha = 0.78$) where greater values indicate greater levels of role ambiguity. Role conflict was measured using a five-item index previously developed to tap officers' perceptions of the alignment between rules and policies within the prison in which they work and what is required to complete their responsibilities (Şenol-Durak et al., 2006). Responses to all five items were summed to create the role conflict index ($\alpha = 0.86$) with greater values indicating increased levels of role conflict. Fifth, a measure of service time was created using the self-reported number of years and months participants had been employed by MnDOC at wave 1. The resulting measure ranged from being on the job for less than a month (0.08 years) to more than 30 years (30.75 years) with an average service time of approximately 9.5 years. Sixth, to better distinguish between influence stemming from work-related critical incidents and exposures to trauma outside the workplace, a six-item violence exposure index was included as a control variable. Participants were asked to indicate whether they had experienced six stressful incidents outside of work within the past 12 months (e.g., *Someone threatened you; Someone you know threatened to commit suicide or self-harm*). Responses were coded dichotomously where 0 = did not occur within the past year and 1 = occurred at least once in the past year and then summed (wave 1: $\alpha = 0.82$).

Seventh, during wave 1 interviews, officers reported the shift they worked most frequently in the past year, with responses including: 1 = first watch (10 PM to 5 AM); 2 = second watch (5 AM to 2 PM); 3 = third watch (2 PM to 10 PM); and 4 = other (any other shift).[6] Since third watch was the most common shift, it served as the reference category in the estimated models. Eighth, to account for systematic operational differences across facilities, study site was recorded during wave 1 data collection and coded as a series of dummy indicator variables for each participating officer, with the second site serving as the reference category.[7] Ninth, to better distinguish work-related stressors from family-level stressors, at wave 1, officers were asked to report their current marital status and whether they lived with children at home. Responses were used to create a four-category indicator variable coded such that 1 = not married/no children, 2 = married/no children, 3 = married/children, and 4 = not married/children. Not married/no children served as the reference category in the resulting models. Tenth, officer age was self-reported at wave 1 and recorded continuously in years. Eleventh, officer sex was self-reported at wave 1 and coded dichotomously such that 0 = female and 1 = male. Finally, race was also self-reported at wave 1 and coded such that 1 = White, 2 = Black, 3 = Latino, and 4 = other race. White was the most common racial category (88.25% of the sample) and served as the reference category.

6.5. Plan of analysis

To better capture the impact of (in)direct assault exposures, a weighted cumulative index of exposure (WCIE; Abrahamowicz, Bartlett, Tamblyn, & du Berger, 2006; Wagner, Grodstein, Leffondre, Samieri, & Proust-Lima, 2021) was estimated. This procedure is used to better approximate the accumulation of exposures to a given experience during a specified observation period, with specific emphasis on the timing of each exposure in relation to a subsequent assessment (i.e., a landmark, which relates to the wave 1 survey and biomarker assessments within the context of the current study). A traditional cumulative index (i.e., a simple count or sum of exposures) would weight each exposure equally, regardless of the amount of time that has elapsed between the exposure and the beginning of the observation period. Alternatively, a WCIE employs weights that upweight the influence of exposures that occur closer to the landmark assessment and down weight the influence of exposures that occur closer to the beginning of the assessment period. To estimate the WCIE weight function, previous studies have recommended the use of cubic regression splines (Danieli, Sheppard, Costello, Dixon, & Abrahamowicz, 2020; Sylvestre & Abrahamowicz, 2009; Wagner et al., 2021).

Regression splines refer to a nonlinear regression technique in which a liner regression line is allowed to “break” across specified points and the resulting lines that span between the breaks can be characterized by different slopes. The “breaks” in the estimated regression lines are referred to as “knots” and are directly responsible for the overall shape of the nonlinear function specified by the model. More specifically, the flexibility of a spline function is directly related to the number of knots—or breaks in the regression line—selected. Sylvestre and Abrahamowicz (2009) recommend between three and five equidistant knots. Based on suggestions outlined by Wagner et al. (2021), a standard linear mixed effects model akin to a growth curve model (i.e., days nested within individuals) can be estimated to identify the most appropriate weight function. To identify the appropriate number of knots, models with three, four, and five knots were estimated and compared using likelihood ratio tests (LRTs) to identify the model with the fewest possible knots that does not result in worsened overall fit (i.e., the most parsimonious model). The corresponding predicted values were estimated from the best fitting and most parsimonious models and used as weights to calculate a WCIE score for each participant for the observation period preceding wave 1 data collection using equations specified in previous research (Abrahamowicz et al., 2006; Sylvestre & Abrahamowicz, 2009). This same procedure was used to calculate a separate WCIE score for indirect assault exposures and direct assault exposures for each participant.

The next step of the analysis involved the estimation of a series of linear regression models. The first set of models examined the association between the accumulation of indirect assault exposure (measured using the WCIE) and cortisol levels. Mean cortisol levels were regressed on the indirect WCIE from the observation period before wave 1 along with all statistical covariates. A second model was estimated in which the indirect WCIE was replaced with the direct WCIE. For the second set of models, mean sAA levels were regressed on the indirect WCIE and all statistical covariates. A second model in which the indirect WCIE was replaced with the direct WCIE was also estimated.

The third set of models examined the association between the accumulated exposure to officer involved assaults and PTSD. For the first model, the PTSD symptoms captured on the wave 1 survey instrument were regressed on the indirect WCIE from the observation period prior to wave 1 along with all study covariates. The second model was virtually identical, but the indirect WCIE was replaced with the direct WCIE. The fourth set of models was similar but examined depressive symptoms. The fifth and final set of models were also similar but examined anxiety symptoms.

All models were estimated using Stata 17 (StataCorp., 2021). Unstandardized coefficients and accompanying 95% confidence intervals

[6] The most common shift worked serves as a control in two ways. First, this measure accounts for systematic fluctuation in critical incident exposures across shifts. Second, shifts also correspond to the time in which salivary samples were collected.

[7] While the employed data are technically nested (i.e., individuals nested within facilities), the limited number of facilities—three in total—does not allow for sufficient between-facility variability to include facility-specific characteristics in the models as statistical controls. This lack of variability would result in autocorrelation which cannot be corrected via multilevel models or even clustered standard errors due to the limited number of clusters (again, only three facilities) within the data. While the precise number remains open to debate, previous simulation studies have revealed that between 30 and 50 clusters are required to properly adjust standard errors (Cameron & Miller, 2015). Given these results and the fact that we do not have a sufficient number of clusters, we are unable to more directly consider specific facility-level characteristics. However, to adjust for clustering in a more indirect manner, we include a series of dummy indicators identifying each facility (with our second site serving as a reference category) as covariates in our multivariable regression models.

were estimated along with standardized (i.e., Beta) coefficients to reflect effect sizes. Missing data patterns were investigated using *t*-tests and logistic regression models and no systematic patterns were identified. Given these results, missing data were addressed using listwise deletion. To examine the potential impact of this modeling decision on the overall pattern of results, supplemental models that employed full information maximum likelihood (FIML) were estimated. FIML has been found to be a reliable, valid, and efficient option in addressing missing values (Allison, 2012). The results from the supplemental models did not systematically vary from the results from the primary analysis. Given these results, and in the interest of model parsimony, all models were estimated using listwise deletion to address missing values.

7. Results

Prior to the estimation of the linear regression models, a series of linear mixed effects models (i.e., growth curve models) were estimated to identify the weights for the WCIE for both (in)direct assault exposures. Since the most appropriate number of knots (i.e., breaks in the regression line) for the spline function is unknown, it must be estimated from the data. Previous research recommends the use of between three and five equidistant knots to maintain model flexibility but also avoid overfitting (Sylvestre & Abrahamowicz, 2009; Wagner et al., 2021). In line with these recommendations, a series of linear mixed models were estimated, and overall fit was compared using LRTs. The results revealed that moving from five to four knots did not significantly improve model fit ($X^2(3) = 0.74$, $p = .865$). Similarly, moving from five to three knots did not improve overall model fit ($X^2(4) = 9.46$, $p = 1.000$). Based on these results, the WCIE for (in)direct exposures was calculated with five knots. The resulting WCIE scores for (in)direct exposures are presented in Table 1.

The next stage of the examined the association between the accumulation of indirect and direct exposure to officer involved assaults and mean levels of cortisol, with the results presented in Fig. 2, including standardized coefficients and accompanying 95% confidence intervals. Importantly, the results presented in the figure are limited to coefficients that are directly related to the key associations specified in the study hypotheses. Tables containing unstandardized coefficients, accompanying 95% confidence intervals, and standardized coefficients for all variables included in the estimated models are presented in the accompanying supplemental information. The left panel of the figure presents the results from the linear regression model examining the association between the accumulation of indirect exposures to officer involved assaults and mean cortisol levels. The results revealed that each standard deviation increase in accumulated indirect assault exposures, cortisol levels increased by 0.126 standard deviation units ($\beta = 0.126$, $p = .011$). Stated differently, those officers with a greater accumulation of indirect assault exposures experienced subsequent slower declines in cortisol over the course of the day, suggesting increased HPA axis activity. The left panel of Fig. 2 also presents the results of a linear model examining the association between the accumulation of direct assault exposures and mean cortisol levels. The association between the accumulation of direct assault exposures was nonsignificant ($\beta = 0.044$, $p = .373$), suggesting that those officers with increased direct exposure to assaults did not display subsequent substantive changes in mean cortisol levels.

The next step in the analysis was aimed at examining the association between (in)direct assault exposures and mean sAA levels, with the results presented in the right-hand panel of Fig. 2. The accumulation of indirect assault exposures was not significantly associated with later sAA levels ($\beta = -0.016$, $p = .756$). Similarly, the increased accumulation of direct assault exposures was not significantly associated with later sAA levels ($\beta = -0.012$, $p = .811$).

The next step in the analysis examined the association between the accumulation of (in)direct assault exposures and PTSD symptoms, with the results presented in the left-hand panel of Fig. 3. The first estimated model examined the association between the accumulation of indirect assault exposures and PTSD symptoms. As indicated in the figure, the resulting association was nonsignificant ($\beta = 0.077$, $p = .086$). Alternatively, as direct assault exposures continued to accumulate, overall PTSD symptoms increased, such that PTSD symptoms increased by 0.123 standard deviation units for each standard deviation increase in accumulated direct assault exposures ($\beta = 0.123$, $p = .005$).

The middle panel in Fig. 3 presents the results of two linear

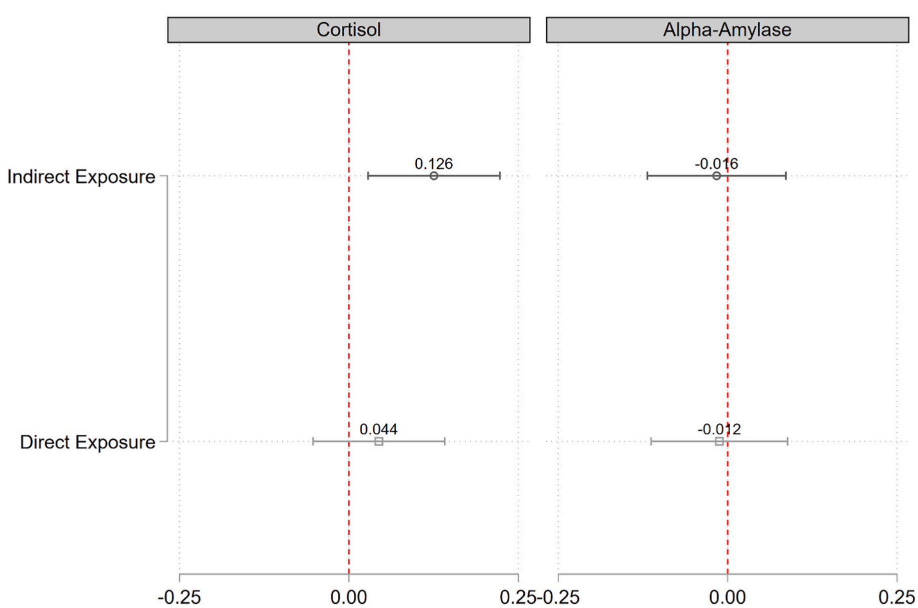

Fig. 2. Models Examining Assault Exposure and Salivary Biomarkers.
Note: Standardized regression coefficients with accompanying 95% confidence intervals presented. The indirect and direct exposures are measured using a weighted cumulative index of exposure. All coefficients are adjusted for job demands, job control, role ambiguity, role conflict, service time, exposure to violence, shift worked, study site, family situation, age, sex, and race. All coefficients with an accompanying 95% confidence interval that does not include zero can be considered significant at the $p < .05$ level. The accompanying unstandardized coefficients, confidence intervals, and standardized coefficients for all variables included in the estimated models are presented in the accompanying supplemental material.

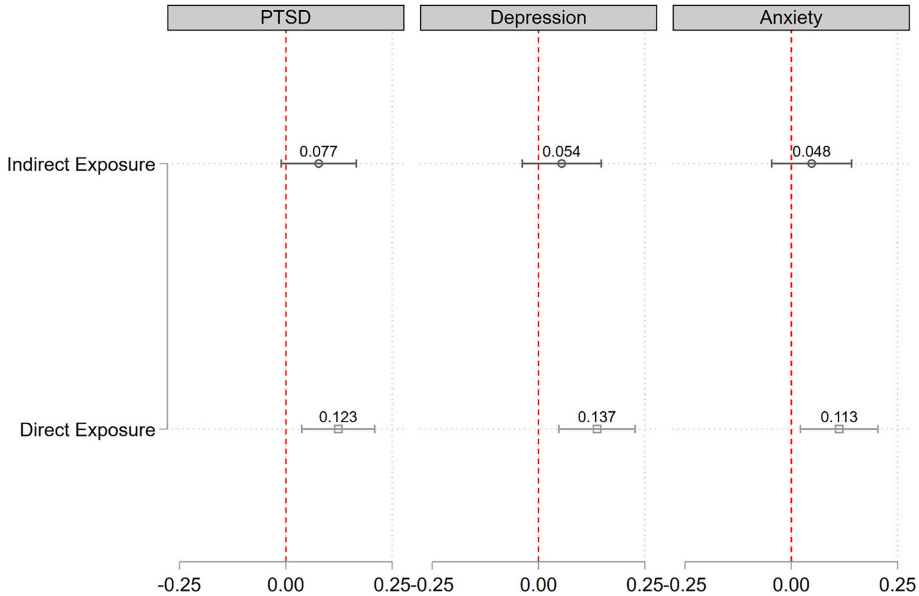

Fig. 3. Models Examining Assault Exposure and Mental Health Outcomes.
Note: Standardized regression coefficients with accompanying 95% confidence intervals presented. The indirect and direct exposures are measured using a weighted cumulative index of exposure. All coefficients are adjusted for job demands, job control, role ambiguity, role conflict, service time, exposure to violence, shift worked, study site, family situation, age, sex, and race. All coefficients with an accompanying 95% confidence interval that does not include zero can be considered significant at the $p < .05$ level. The accompanying unstandardized coefficients, confidence intervals, and standardized coefficients for all variables included in the estimated models are presented in the accompanying supplemental material.

regression models examining the association between the accumulation of (in)direct assault exposures and depression. The association between the accumulation of indirect assault exposures and depression was nonsignificant ($\beta = 0.054$, $p = .250$). However, as direct assault exposures continued to accumulate, depression symptoms also increased, wherein depression symptoms increased by 0.137 standard deviation units for each standard deviation increase in accumulated direct assault exposures ($\beta = 0.137$, $p = .003$).

Finally, the right-hand panel of Fig. 3 presents the results from two linear regression models examining the associations between the accumulation of (in)direct assault exposures and subsequent anxiety symptoms. Once again, the association between the accumulation of indirect assault exposures and anxiety symptoms was nonsignificant ($\beta = 0.048$, $p = .317$). Similar to the previous models, however, as direct assault exposures continued to accumulate overall levels of anxiety also increased, such that each standard deviation increase in accumulated direct assault exposures resulted in a 0.113 standard deviation unit increase in anxiety symptoms ($\beta = 0.113$, $p = .015$).

8. Discussion

Previous research has documented the consequences of on-the-job violence exposure for COs' mental health and wellbeing (Frost & Monteiro, 2020; Regehr et al., 2019; Schwartz et al., 2023; Spinaris et al., 2012). Despite these contributions, the examination of violent experiences among COs has typically been limited to direct exposures. While such interactions are important, there is preliminary evidence suggesting that indirect exposures—via briefings, interactions with other officers, and witnessing an incident—may also result in increased levels of stress and subsequent mental health problems in unique and important ways (Luthra et al., 2009; St. Louis et al., 2023; Wilson, 2015). For example, using a cross-sectional design, Ellison and Jaegers (2022) found exposure to violence, both in and outside of the workplace, contributes to variation in PTSD symptoms among jail officers. Relying on a combination of official records and narratives covering a set exposure interval, the current study builds on findings from the existing literature to further explore the potential role of the accumulation of (in)direct exposures to officer involved assaults on CO physiological activity and mental health. The results produced three key findings.

First, officers who experienced a greater accumulation of indirect assault exposures also displayed subsequently slower overall declines in daily cortisol. This finding is problematic, as increased levels of cortisol over sustained periods of time have been linked to a wide variety of chronic illnesses (McEwen & Seeman, 1999) and mental health problems (Adam et al., 2017). The connection between chronic stress and mental health problems is believed to be significantly mediated by atrophy of the hippocampus, a limbic structure located in the midbrain that is responsible for short- and long-term memory formation and recall (Lupien et al., 1998). The hippocampus is sensitive to cortisol (along with other glucocorticoids) and increased levels of cortisol experienced over an extended period of time has been linked to decreased volume (Sapolsky, 2000). Decreased hippocampal volume, in turn, has been linked with a variety of mental health disorders including PTSD (Shin et al., 2006) and depression (Campbell & MacQueen, 2004). Given that one commonly noted symptom of PTSD is the lack of the ability to remember important parts of a stressful experience, the memory issues caused by hippocampal atrophy may play an important role. This possibility tentatively points to the importance of exploring additional outcomes of work stress as well as the more specific dimensions of PTSD in future research.

Given the role of increased cortisol levels in the development of mental and physical health problems, this finding suggests that as indirect exposures to violent incidents (i.e., officer involved assaults) continue to accumulate, the likelihood that officers eventually experience more serious mental health problems may increase. Given the salience of such exposures—nearly a quarter of all officers in the current sample were indirectly exposed to an officer involved assault over an approximately nine month period—and mental health problems among COs (Regehr et al., 2019; Spinaris et al., 2012), this finding provides insight into some of the factors contributing to what has been recognized as a wellness crisis within corrections (TCR Staff, 2022). Further, this finding suggests the potential negative consequences of violence within correctional institutions not only impact those who are directly involved in a given incident but can also spill over to others. On the one hand, these findings are troubling, as they suggest that the negative influence of assaults within prisons and other correctional institutions is far more pervasive than typically characterized, potentially impacting a significant number of individuals beyond those directly involved in any single incident. On the other hand, this finding can be viewed more positively, as efforts to mitigate violence can be expected to have a more penetrating impact on the larger correctional institution, as such efforts, if effective, would lessen both direct and indirect exposures to violence. Given these results, future research would benefit from a more thorough understanding of the role of indirect violence exposure on stress responsivity and mental health problems among COs.

Second, while the accumulation of indirect assault exposures was associated with increased average cortisol levels, the accumulation of both indirect and direct assault exposures was not associated with averaged sAA levels. There are at least two possible explanations for these findings. First, these findings may be a result of the specific physiological stress system examined. Recall that sAA reflects activity in the SNS, the so-called "fight or flight" stress response. For this reason, the SNS is considered a fast-reacting neural path and displays increased activity almost immediately following stressor exposure (Del Giudice, Ellis, & Shirtcliff, 2011). Since the measurement of (in)direct assault exposures may have occurred days, weeks, or even months prior to the measurement of sAA it is possible that any salient changes in SNS activity were not detected, as they would have occurred immediately after exposure. While the current study was more directly focused on broader physiological functioning patterns, given this possibility, future research would benefit from a research design that allows for a more targeted approach in which SNS activity is assessed immediately following exposure (either direct or indirect).

The lack of an association between accumulated direct assault exposures and HPA axis activity is also unexpected, but one possible theoretical explanation for this observation may also be at play. Previous research has indicated that as stressor exposures increase in frequency and/or intensity, accompanying stress responses decrease over time, a phenomenon referred to as *habituation* (Rankin et al., 2009). Previous studies have recognized a similar pattern among populations that commonly experience (in)direct exposure to violence, including inner-city youth, noting a *pathologic adaptation to violence* (Ng-Mak, Salzinger, Feldman, & Stueve, 2004). As violence exposures accumulate, stress responses are blunted, normalizing these experiences, and promoting maladaptive responses like mental health problems.

While only speculation, it is possible that officers who directly experience an assault—a more intense stressor—are more likely to display blunted stress responses but increased levels of mental health problems. This possibility is further underscored by additional findings from the current study that revealed more consistent associations between increased accumulation of direct assault exposures and mental health problems, which we will return to later. Finally, the observed association between accumulated indirect assault exposures and increased average cortisol levels also supports this possibility, as indirect exposures are expected to be less intense and may be less likely to result in habituation or promote a pathologic adaptation to violence. Currently, however, these observations remain speculative and additional research more directly aimed at observing physiological processes related to habituation and a pathologic adaptation to violence among COs is needed.

The third key finding from the current study was that the increased accumulation of direct assault exposures was associated with subsequently increased PTSD, depression, and anxiety symptoms. Increased accumulation of indirect assault exposures was not significantly associated with increased mental health problems. However, it is worth noting the observed association between indirect exposures and average cortisol levels indicates that as these exposures accumulate, the collective downstream impact on mental health may become more pronounced. These findings align with those from previous studies examining other populations that are commonly exposed to violence, wherein mental health problems vary as a function of the degree to which the violence exposure occurs (Wilson, 2015). These findings suggest that a greater accumulation of direct assault exposures may have a more immediate impact on mental health relative to indirect exposures. Further, and as discussed previously, the mental health problems examined in the current study represent only a small subset of the problems differentially experienced by COs and others differentially exposed to violence. For these reasons, future research would benefit from also exploring the overall impact that (in)direct assault exposures and other sources of workplace violence may have on other mental health problems among COs. For example, previous research has demonstrated the importance of examining multiple dimensions of PTSD among trauma-exposed populations (Elhai, Contractor, Palmieri, Forbes, & Richardson, 2011). A similar approach would be beneficial in identifying the more precise ways that work-related violence impacts COs' mental health and what treatment options are most appropriate.

These findings indicate that corrections departments interested in improving officers' mental health and wellbeing should consider implementing treatment programming directly aimed at offering support immediately following a direct assault exposure. For example, previous recommendations from a working group organized by the Bureau of Justice Assistance and the Office of Community Oriented Policing Services aimed at improving officer wellbeing and resilience recommended the use of debriefing following a violent interaction to identify officer needs and make connections with appropriate resources (Spence, 2017). Given the results of the current study, these approaches appear to be particularly important for officers experiencing direct exposures to assault and violence, but they may also be impactful for those who have experienced indirect exposures. Moving forward, treatment and programming aimed at improving officers' health and wellbeing would benefit from expanding focus to consider the long-term impact of both direct and indirect exposures to violent incidents.

Despite the contributions of the current study, these findings should be considered within the context of several limitations. First, since the employed sample of COs was drawn from three facilities within a single state, the extent to which these findings will extend to larger populations of COs is unknown. Second, since the analytic sample was drawn from officers across three prisons, we did not have sufficient between-facility variability to allow for the direct consideration of facility characteristics in our analytic models. Future research would benefit from the use of a similar sample with officers from a larger number of facilities to better isolate the potential impact of facility-specific characteristics in the development of stress and stress-related outcomes. Third, officer involved assaults were selected as the primary source of occupational violence in the current study. While such incidents have been recognized as being particularly salient and acute violent events (Jaegers et al., 2022; Ricciardelli et al., 2018), COs encounter other sources of direct (Ellison et al., 2022; Ellison & Jaegers, 2022; St. Louis et al., 2023) and indirect violence while on the job (Brower, 2013; Spinaris et al., 2012; Steiner & Wooldredge, 2015). Whether the findings from the current study extend to other forms of violence exposure, is unknown. Fourth, and related, the use of administrative data made it impossible to distinguish between threats of violence and actual violence as threats and assault attempts are also defined as an assault by the MnDOC. Future research aimed at better distinguishing between both sources of influence would be beneficial.

Fifth, the current study examined the accumulation of assault exposures over a specified timeframe as opposed to lifetime prevalence, allowing for a better localization of the impact of both indirect and direct assault. While a significant number of officers experienced both direct and indirect assaults during the approximately nine-month observation period, an extended timeframe may be beneficial, as it would provide an opportunity to examine the potential impact of a greater accumulation of both direct and indirect exposures. Sixth, also related to the assault exposure measures, the assault prevalence reported in the current study was significantly lower than what has been reported in previous studies (for example, see St. Louis et al., 2023). While only speculation, we believe these truncated prevalence rates are the result of a shorter observation period (as discussed previously) and the use of administrative data as opposed to self-report measures. More specifically, the use of administrative data likely underestimates overall assault exposures (both direct and indirect) due to officer underreporting, as previous studies have demonstrated that rule enforcement may be disincentivized via officer subculture resulting in fewer reported incidents (Haggerty & Bucerius, 2021). Importantly, truncated variation in the examined assault exposures would result in inflated standard errors and an increased likelihood of a Type II error. For this reason, future research aimed at supplementing administrative data with self-reports of (in)direct exposures to assaults may result in larger and more consistent effects than those reported in the current study. Seventh, and as discussed previously, the measurement of the salivary biomarkers was intended to tap average, daily levels of cortisol and sAA, not short-term physiological changes stemming directly from assault exposures. A research design that either assesses physiological changes more frequently or immediately following exposure to an assault would be helpful in better understanding the connection between such exposures and more immediate physiological changes.

Eighth, and also related to the employed biomarkers, due to the employed research methodology wherein saliva samples were collected while officers were on shift, it was not logistically feasible to collect additional samples during the course of the day. While this practice is more common within laboratory settings or ecologies in which participants can provide additional samples, due to the nature of their work, COs could not be removed from their assigned posts multiple times, necessitating the collection of two samples. Future research would benefit from collecting saliva samples outside of work or in a setting that would better allow for multiple samples per participant. Also related to the ecology in which the samples were collected, other biomarkers commonly examined in conjunction with cortisol and sAA (e.g., heart rate, body mass index, blood pressure, etc.) were unavailable. Future research aimed at employing a research methodology that would allow for the collection of these additional biomarkers would be extremely beneficial. Ninth, while the employed mental health measures have been previously validated, they rely on self-reported measures rather than clinical diagnoses. Finally, mental health problems are just one stress-related issue officers experience. Physical health problems (Brower, 2013; Denhof & Spinaris, 2016), burnout (Schaufeli & Peeters, 2000), and work-family conflict (Brower, 2013), among other issues, are differentially experienced by COs. Future research would benefit from examining whether the findings reported here also extend to other deleterious outcomes, with a specific emphasis on the role of indirect exposures to violence.

Despite these limitations, the results of the current study indicate that violence in correctional facilities has a more pervasive impact on COs than previously reported. In addition to the consequences of direct exposures to violence, our results indicate that the accumulation of indirect exposures has a different, but still noteworthy, impact on officers. This information is critical, as any programming aimed at improving officer health and wellbeing should target both direct and indirect exposures when attempting to mitigate negative, stress-related outcomes including mental health problems. Our results also indicate that violence reduction efforts within facilities are likely "doubly impactful," in that their benefits would extend to officers and incarcerated individuals who would have directly experienced such incidents, but also a much broader set of individuals who would have been indirectly impacted by such experiences. A greater focus on the role of indirect exposures to violence is warranted to better understand and control the various harms spurred by violence.

CRediT authorship contribution statement

Joseph A. Schwartz: Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Samantha L. Allen:** Writing – review & editing, Writing – original draft, Conceptualization.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jcrimjus.2024.102212.

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