Psychiatry Research 337 (2024) 115920

Contents lists available at ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

Letter to the Editor

Pre-trauma sleep difficulties and fatigue predict trauma-induced changes in mental health symptoms in recruit police officers

Dear Editor,

Civilian emergency services, like police, regularly encounter potentially traumatic events (Inslicht et al., 2011). Consequently, many police experience mental health symptoms related to trauma, including post-traumatic stress disorder (PTSD), anxiety and depression (Syed et al., 2020). Poor sleep and fatigue are also common in demanding occupations (Inslicht et al., 2011; Koffel et al., 2013) and frequently occur in mental health conditions (McCallum et al., 2019). While traditionally considered as sequelae of stress, evidence indicates poor sleep and fatigue may predispose to trauma-related psychopathology (Gehrman et al., 2013; Koffel et al., 2013). For instance, in military personnel, sleep disturbances and fatigue pre-deployment to a warzone predict post-deployment PTSD, anxiety and depression (Gehrman et al., 2013; Koffel et al., 2013). Due to limited longitudinal research in civilian emergency services, however, it is unclear whether sleep and fatigue predict the development of mental health symptoms in police.

We extracted data from the Police-in-Action study (Koch et al., 2017) to determine whether pre-trauma sleep and fatigue predicted changes in mental health post-trauma. We hypothesised baseline sleep disturbances and fatigue would predict higher mental health symptoms post-trauma in police, but these associations would not be reflected in the general population.

Recruit police (n = 342) from the Dutch Police Academy were assessed before (baseline) and after (follow-up) a 15-month period. Baseline occurred at the academy, prior to emergency work. Follow-up occurred after recruits had been exposed for the first time to emergency work, consisting of 2 × 4-month intervals of police work within the 15-month period. In total, 225 recruits reported a core trauma between timepoints and were included in analyses. Control participants (n = 85) from the Dutch general population were also included, matched on sex, age, and education. Controls completed two timepoints, separated by 15-months, but were not exposed to emergency work between assessments. At baseline, all participants were free of current or previous psychiatric disorders. See Koch et al. (2017) for additional criteria. The Independent Review Board Nijmegen approved the project.

At each timepoint, participants completed measures to assess mental health (PTSD Checklist for DSM-5 [PCL-5], Beck Depression Inventory [BDI], state component of State-Trait Anxiety Inventory, Perceived Stress Scale) and trauma (Police Life Events Scale [PLES]). At follow-up, the Clinician-Administered PTSD Scale was administered to determine which police experienced a core trauma.

The baseline sleep difficulties variable was a composite measure which captured participants experiencing poorer sleep than normal or late insomnia on the BDI (Item 16) and/or initial or middle insomnia on the PCL-5 (Item 20). The BDI tiredness item (Item 17) was used to evaluate baseline fatigue.

Linear regressions examined whether baseline sleep and fatigue predicted changes in mental health (Δ-symptoms, follow-up−baseline), adjusting for baseline demographics, baseline trauma exposure (PLES), change in trauma exposure (Δ-PLES, follow-up−baseline) and baseline mental health symptoms. Values in top/bottom 0.1 % of expected/theoretical normal distribution were excluded.

Among police, baseline sleep difficulties predicted post-trauma increases in depression and stress symptoms and baseline fatigue predicted post-trauma increases in depression and anxiety symptoms (Table 1). Sleep difficulties were not related to anxiety, and neither sleep nor fatigue were related to PTSD among police (Table 1). Sleep and fatigue were not associated with any mental health outcome among controls (Table 1).

Our finding that pre-trauma sleep difficulties predict depression in police aligns with mounting evidence in the military (Gehrman et al., 2013; Koffel et al., 2013). This consistency across the military and emergency literature points to sleep being a key early risk factor for depression in populations at risk of trauma. Evidence indicates treating sleep problems reduces depression in adults with mental health and sleep disturbances (Boland et al., 2023). For example, treating insomnia with cognitive behavioural therapy for insomnia reduces the worsening of depression symptoms and may also reduce the risk for the onset of depression, although the latter requires additional research (Boland et al. 2023). Our findings therefore support further research exploring interventions targeting sleep difficulties to decrease depression in high-risk occupations.

Baseline sleep difficulties were not significantly related to follow-up PTSD in police. This contrasts Inslicht and collegues (2011) who found poor sleep during academy training predicted increased PTSD symptoms after 24- and 36-months of police work. Unlike this study, however, we assessed police after 15-months, of which 8-months were spent completing emergency work, and recruits with pre-existing psychiatric disorders were excluded. Our exclusion criteria and shorter follow-up may have produced lower mental health symptoms and cumulative trauma, thus limiting our ability to detect a relationship between sleep and PTSD. The lack of evidence for this relationship may also be due to insufficient statistical power.

This is the first study to provide evidence that fatigue pre-trauma is a risk factor for depression in emergency workers. Although this finding is novel for emergency services, pre-deployment fatigue and sleep complaints were found to predict post-deployment depression in the military (Koffel et al., 2013). Pre-trauma fatigue also predicted anxiety in police, but sleep did not. This was interesting given fatigue and sleep overlap with anxiety (McCallum et al., 2019), and pre-deployment sleep problems predicted anxiety in soldiers 3-years post-deployment (Gehrman et al., 2013). This may suggest the relationship between sleep and

https://doi.org/10.1016/j.psychres.2024.115920
Received 6 June 2023; Received in revised form 3 February 2024; Accepted 16 April 2024
Available online 18 April 2024

Table 1
Linear regression models examining sleep difficulties and fatigue at baseline as predictors of change in mental health symptoms (Δ-symptoms, follow-up−baseline) in police officers who experienced any (non-work or work-related) core trauma‖ between baseline and follow-up and in control participants.

Variable	Police group				Control group			
	Unstandardized β	SE	95 % CI	p value	Unstandardized β	SE	95 % CI	p value
PTSD symptoms (PCL-5)†, #								
Baseline sleep difficulties‡, §, *, ††	0.301	0.173	−0.039 to 0.642	0.083	−0.504	0.318	−1.137 to 0.130	0.117
Baseline fatigue‡‡, §, ¶, §§	0.134	0.154	−0.148 to 0.438	0.382	−0.292	0.291	−0.873 to 0.288	0.319
Depressive symptoms (BDI)‖‖, #								
Baseline sleep difficulties‡, §, *, ††	**0.371**	**0.133**	**0.109 to 0.633**	**0.006**	−0.040	0.191	−0.420 to 0.341	0.835
Baseline fatigue‡‡, §, ¶, §§	**0.264**	**0.117**	**0.033 to 0.496**	**0.025**	0.163	0.214	−0.264 to 0.589	0.450
Anxiety symptoms (S-STAI)#								
Baseline sleep difficulties‡, §, * , ††	0.051	0.031	−0.010 to 0.112	0.099	0.016	0.050	−0.084 to 0.116	0.752
Baseline fatigue‡‡, §, ¶, §§	**0.060**	**0.027**	**0.007 to 0.113**	**0.028**	−0.010	0.047	−0.104 to 0.084	0.827
Stress symptoms (PSS)##								
Baseline sleep difficulties‡, §, **, ††	**2.784**	**1.191**	**0.436 to 5.132**	**0.020**	−0.937	2.411	−5.747 to 3.873	0.699
Baseline fatigue‡‡, §, ¶¶, §§	1.170	0.954	−0.711 to 3.052	0.222	−2.475	1.938	−6.341 to 1.392	0.206

SE, standard error; CI, confidence interval; PTSD, post-traumatic stress disorder; PCL-5, PTSD Checklist-5; BDI, Beck Depression Inventory; S-STAI, state component of State-Trait Anxiety Inventory; PSS, Perceived Stress Scale.

‖ Core trauma included any of the following events: suicide or suicide attempt, traffic accident, physical assault, CPR (cardiopulmonary resuscitation), sexual assault, serious illness, injury or death and natural disaster.

§ Adjusted for baseline age, sex and body mass index, baseline trauma exposure (Police Life Events Scale, PLES), change in trauma exposure between baseline and follow-up (Δ-PLES), and baseline symptoms of the mental health outcome (i.e., PTSD, depression, anxiety, or stress symptoms) in the model.

† PCL-5 sleep item was excluded from the PCL-5 when examining baseline sleep difficulties as a predictor of PTSD.

‖‖ BDI sleep item was excluded from the BDI when examining baseline sleep difficulties as a predictor of depression. BDI fatigue item was excluded from the BDI when examining baseline fatigue as a predictor of depression.

‡ The baseline sleep difficulties variable was a single composite measure that captured any participants experiencing poorer sleep than normal on the BDI (i.e., Item 16, 1=*"I don't sleep as well as I used to"*) or late insomnia on the BDI (i.e., Item 16, 2=*"I wake up 1–2 h earlier than usual and find it hard to get back to sleep"* or 3=*"I wake up several hours earlier than I used to and cannot get back to sleep"*) and/or moderate or greater symptoms of initial or middle insomnia on the PCL-5 (i.e., Item 20, *"Trouble falling asleep or staying asleep?"*).

‡‡ The baseline fatigue variable captured any participants responding to Item 17 on the BDI with a score ≥1 (i.e., 1=*"I get tired more easily than I used to"*, 2=*"I get tired from doing almost anything"* or 3=*"I am too tired to do anything"*).

* $n = 213$ police (12 observations deleted due to missingness).

¶ $n = 212$ police (13 observations deleted due to missingness).

** $n = 207$ police (13 observations deleted due to missingness and 5 extreme values removed).

¶¶ $n = 208$ police (14 observations deleted due to missingness and 3 extreme values removed).

†† $n = 78$ controls (7 observations deleted due to missingness).

§§ $n = 77$ controls (7 observations deleted due to missingness and 1 extreme value removed).

Mental health outcome measure (i.e., Δ-symptoms), baseline mental health symptom measure, PLES (both baseline and Δ-PLES) and body mass index were logarithmic transformed in the model.

PLES (both baseline and Δ-PLES) and body mass index were logarithmic transformed in the model.

Bold typeface indicates significant associations at $p < 0.05$. These associations remained significant after adjusting for multiple comparisons using the two-stage step-up procedure for False Discovery Rate (FDR) correction (FDR set at <0.10, q-values not shown).

anxiety is weaker over shorter periods, like the 15-month follow-up in our study, however further research is needed.

Our use of items from the PCL-5 and BDI to create the sleep and fatigue variables was a limitation, given these items haven't been separately validated as sleep or fatigue assessments. Despite this, a strength of the study was the inclusion of a matched control group. Unlike police, sleep and fatigue were not related to mental health in controls, suggesting the associations in police are a result of their trauma exposure. Consistent with this, we found sleep and fatigue were not related to mental health in police unexposed to trauma (data not shown). Compared to police, however, there were fewer controls, potentially limiting our ability to detect associations in controls and preventing investigation of interactions.

Poor sleep and fatigue are pre-trauma risk factors for mental health symptoms in police. Given the prevalent mental health issues in police, our findings highlight sleep and fatigue as targets to prevent trauma-related mental health outcomes in this occupation.

CRediT authorship contribution statement

Alexander P. Wolkow: Writing – review & editing, Writing – original draft, Formal analysis, Conceptualization. **Reinoud Kaldewaij:** Writing – review & editing, Project administration, Methodology, Investigation, Data curation, Conceptualization. **Floris Klumpers:** Writing – review & editing, Supervision, Project administration, Methodology, Investigation, Data curation, Conceptualization. **Saskia B.J. Koch:** Writing – review & editing, Supervision, Project administration, Methodology, Investigation, Data curation, Conceptualization. **Annika Smit:** Writing – review & editing, Resources, Project administration, Conceptualization. **Sean P.A. Drummond:** Writing – review & editing, Supervision. **Karin Roelofs:** Writing – review & editing, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization.

Declaration of competing interest

APW reports grants from the NHMRC (APP1138322), during the conduct of the study; grants from the Australian Research Council, outside the submitted work; and being a board member of the Sleep Health Foundation.

Acknowledgements

The authors thank all participants for their willingness to participate in this study. The authors thank personnel of the Dutch Police Academy for their valuable help with recruiting participants and facilitating this study. The authors gratefully acknowledge contributions of I. Kersten, T. Döpp, N. de Valk, L. Bovy and L. Nuijen in participant recruitment and data acquisition, N. Garaux in assistance with data analysis and V. van Ast for her help with setting up the study.

Funding source declaration

This study was supported by the Netherlands Organization for Scientific Research (NWO), VICI-grant 453–12–001 awarded to KR, also supporting RK, FK and SBJK. APW was supported by an NHMRC Peter Doherty - Australian Biomedical Fellowship (APP1138322) during the conduct of the study. None of the funders had influence on study design, protocol development or reporting of results.

References

Boland, E.M., Goldschmied, J.R., Gehrman, P.R., 2023. Does insomnia treatment prevent depression? Sleep 46. https://doi.org/10.1093/sleep/zsad104.

Gehrman, P., Seelig, A.D., Jacobson, I.G., Boyko, E.J., Hooper, T.I., Gackstetter, G.D., Ulmer, C.S., Smith, T.C., 2013. Predeployment sleep duration and insomnia symptoms as risk factors for new-onset mental health disorders following military deployment. Sleep 36, 1009–1018. https://doi.org/10.5665/sleep.2798.

Inslicht, S.S., Otte, C., McCaslin, S.E., Apfel, B.A., Henn-Haase, C., Metzler, T., Yehuda, R., Neylan, T.C., Marmar, C.R., 2011. Cortisol awakening response prospectively predicts peritraumatic and acute stress reactions in police officers. Biol. Psychiatry 70, 1055–1062. https://doi.org/10.1016/j.biopsych.2011.06.030.

Koch, S.B.J., Klumpers, F., Zhang, W., Hashemi, M.M., Kaldewaij, R., van Ast, V.A., Smit, A.S., Roelofs, K., 2017. The role of automatic defensive responses in the development of posttraumatic stress symptoms in police recruits: protocol of a prospective study. Eur. J. Psychotraumatol. 8, 1412226 https://doi.org/10.1080/20008198.2017.1412226.

Koffel, E., Polusny, M.A., Arbisi, P.A., Erbes, C.R., 2013. Pre-deployment daytime and nighttime sleep complaints as predictors of post-deployment PTSD and depression in National Guard troops. J. Anxiety Disord. 27, 512–519. https://doi.org/10.1016/j.janxdis.2013.07.003.

McCallum, S.M., Batterham, P.J., Calear, A.L., Sunderland, M., Carragher, N., Kazan, D., 2019. Associations of fatigue and sleep disturbance with nine common mental disorders. J. Psychosom. Res. 123, 109727 https://doi.org/10.1016/j.jpsychores.2019.05.005.

Syed, S., Ashwick, R., Schlosser, M., Jones, R., Rowe, S., Billings, J., 2020. Global prevalence and risk factors for mental health problems in police personnel: a systematic review and meta-analysis. Occup. Environ. Med. 77, 737–747. https://doi.org/10.1136/oemed-2020-106498.

Alexander P. Wolkow[a,b,*], Reinoud Kaldewaij[c,d], Floris Klumpers[c,d], Saskia B.J. Koch[c,d], Annika Smit[e,f], Sean P.A. Drummond[a], Karin Roelofs[c,d]

[a] *School of Psychological Sciences, Turner Institute for Brain and Mental Health, Monash University, Clayton, Victoria, Australia*

[b] *Paramedic Health and Well-being Research Unit, Monash University, Frankston, Victoria, Australia*

[c] *Donders Institute for Brain, Cognition and Behaviour, Centre for Cognitive Neuroimaging, Radboud University, Nijmegen, the Netherlands*

[d] *Behavioural Science Institute, Radboud University, Nijmegen, the Netherlands*

[e] *Police Academy of the Netherlands, Apeldoorn, the Netherlands*

[f] *University of Humanistic Studies, Utrecht, the Netherlands*

[*] Corresponding author at: School of Psychological Sciences, Turner Institute for Brain and Mental Health, Monash University, Building 1, 270 Ferntree Gully Road, Notting Hill, VIC 3168, Australia.
E-mail address: alexander.wolkow@monash.edu (A.P. Wolkow).