Perceived Fitness Protects against Stress-based Mental Health Impairments among Police Officers Who Report Good Sleep

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Abstract: Perceived Fitness Protects against Stress-based Mental Health Impairments among Police Officers Who Report Good Sleep: Markus Gerber, et al. Institute of Exercise and Health Sciences, University of Basel, Switzerland—Objectives: This study examined a cognitive stress-moderation model that postulates that the harmful effects of chronic stress are decreased in police officers who perceive high levels of physical fitness. It also determined whether the stress-buffering effect of perceived fitness is influenced by officers’ self-reported sleep. Methods: A total of 460 police officers (n=116 females, n=344 males, mean age: M=40.7; SD=9.7) rated their physical fitness and completed a battery of self-report stress, mental health, and sleep questionnaires. Three-way analyses of covariance were performed to examine whether officers’ self-reported mental health status depends on the interaction between stress, perceived fitness and sleep. Results: Highly stressed officers perceived lower mental health and fitness and were overrepresented in the group of poor sleepers. Officers with high fitness self-reports revealed increased mental health and reported good sleep. In contrast, poor sleepers scored lower on the mental health index. High stress was more closely related to low mental health among poor sleepers. Most importantly, perceived fitness revealed a stress-buffering effect, but only among officers who reported good sleep. Conclusions: High perceived fitness and good sleep operate as stress resilience resources among police officers. The findings suggest that multimodal programs including stress management, sleep hygiene and fitness training are essential components of workplace health promotion in the police force.

Key words: Insomnia, Mental health, Moderator, Multiple risk factors, Short-form health survey (SF-12), Stress buffer

People are at risk of becoming ill when they are exposed to stress. Factors such as longer working hours, heavier workloads, more robust managerial styles, less job control and increased pressure influence the experiences of employees at work and, in turn, affect their health and well-being. According to Badura and Hehlmann, organizations are experiencing pressure to work flexibly and efficiently in globalized markets, which requires healthy and motivated personnel to cope with these challenges. On the other hand, exposure to occupational stress is associated with both physical impairments and mental health problems. These complications can negatively impact work productivity as well as worker health.

During recent decades, police work has undergone considerable adjustment. On the one hand, statistics show a dramatic increase in violent crime in some Western countries such as Switzerland. On the other hand, the role of the police has gradually shifted towards community policing. Thus, police offers not only enforce laws and investigate crimes but also provide proactive social services. With these additional functions, the police encounter increased scrutiny on how they use their power. Modern policing has therefore become a balancing act with officers “caught between the increasing threat of violence on our streets, high public demands and a mounting focus on police efficiency and probity.”

Among health interventionists, there is general consensus that promoting physically active lifestyles and cardiorespiratory fitness (CRF) are important parts of occupational health promotion. Low CRF is associated with decreased job performance, increased absenteeism rates and increased risk for future cardio-
vascular disorders\(^{10}\).

In contrast, high levels of CRF have proved to reduce cardiovascular risk markers and mortality\(^{11}\). Previous research also demonstrated close links between CRF and mental health. For instance, studies showed that high CRF protects against the development of depressive symptoms\(^{12}\), and that high CRF is associated with reduced symptoms of occupational burnout\(^{13}\). In summary, these findings suggest that psychosocial stress and physical fitness have opposite effects on both physical and mental health parameters.

Field studies have shown that regular participation in exercise activities can mitigate the adverse health outcomes associated with high stress exposure\(^{14}\). Nevertheless, research is scarce regarding the ability of increased physical fitness to attenuate the relationship between perceived stress and impaired health in the adult workforce.

The present investigation expands previous stress-buffer research by placing a specific focus on the study of perceived physical fitness. This new focus is warranted because in previous studies, self-rated fitness was more closely related to mental health and daily stress than objective fitness measures\(^{15}\). This suggests that some of the positive emotional results associated with exercise may occur because of the psychological gains from the experience of trying to get fit or believing that one is fit rather than from an increase in aerobic physical fitness\(^{16}\). Moreover, perceived fitness proved to be more closely associated with quality of sleep than self-reported exercise\(^{17}\). Lastly, perceived fitness explained significant variance in psychological and physiological stress reactivity, even more than that attributable to estimated aerobic fitness\(^{18}\). In conclusion, these findings suggest that perceived fitness is an important health resource, and that subjective perceptions of fitness are at least equally important as objective aerobic fitness estimates to predict mental health outcomes\(^{19}\).

Given the literature presented above, the first aim of the present study was to test a cognitive stress-moderation model positing that stress impairs individuals’ mental health status and that perceived fitness attenuates this relationship. The second aim was to determine whether the stress-buffering potential of perceived fitness is associated with sleep. This aspect is relevant because there is a dearth of research regarding fitness as a resilience resource among individuals with multiple risk factors. Sleep was selected as an additional risk factor because it emerged in previous research that there is a close relationship between stress and sleep among police officers\(^{20}\) and because physical exercise is positively associated with quality of sleep\(^{21}\).

The following eight hypotheses will be investigated in the present study. Hypotheses 1–3: Increased stress is associated with decreased mental health levels\(^{21}\), whereas high perceived fitness\(^{22}\) and good sleep\(^{23}\) are associated with increased mental health. Hypotheses 4–6: We further expected a positive association between high stress and poor sleep\(^{24}\), and we assumed that high perceived fitness is related to lower stress\(^{21}\) and good sleep\(^{25}\). Hypothesis 7: We also hypothesized that high perceived fitness attenuates the negative relationship between stress and mental health\(^{26}\). Hypothesis 8: Nevertheless, we assumed that the strongest stress-buffering effect occurs with simultaneously reported high stress and poor sleep. Hypothesis 8 was derived from the finding that poor and deprived sleep have tremendous negative effects on performance and well-being\(^{20}\). Poor sleepers have limited stress-coping capacities and are therefore at risk for further stress increases\(^{27}\). This may also support research showing that good sleep can bolster stress recovery\(^{28}\).

Materials and Methods

Participants

The sample consisted of 460 police officers working in an urban area in the German-speaking part of Northwestern Switzerland. The mean age was 40.7 years (SD=9.7 years). Respondents reported an average of 13.7 (SD=9.0) years of service. The sample included personnel from all managerial levels, with 55% (n=251) being shift-workers. Men comprised 75% (n=344) of the sample and women 25% (n=116). The majority of the officers were married (56%, n=256) and did not have a university degree (89.6%; n=412).

Procedure

A battery of validated questionnaires was sent to all police officers. In an accompanying letter, the officers were informed about the purpose of the study, the voluntary and anonymous nature of participation and the confidentiality of the information. Participants provided written informed consent. The questionnaire took approximately 20–25 minutes to complete. The completed questionnaires were sent back directly to the researchers in a prepaid envelope. The response rate was 48%. The gender distribution (25% females) represented the general police force (21% females) (Chi\(^2\)=2.00, p=ns). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Measures

1) Control variables

Information was acquired about gender, age, body mass index (BMI: body weight in kg/body height
in m²), highest level of education and shift/non-shift work schedules. Participants also reported the amount of cigarettes smoked per day on a 5-point Likert scale ranging from 0 (none) to 4 (>20 cigarettes/day) and weekly alcohol consumption (0–7 days).

2) Chronic stress

The Chronic Stress Screening Scale (SSCS) of the Trier Inventory for the Assessment of Chronic Stress (TICS) was administered to assess chronic stress²⁹. The SSCS includes three items related to work overload (e.g., “too many tasks at the same time”), one item related to excessive social stress (“I perceive the responsibility for other people as a burden.”), two items related to excessive demands at work (e.g., “I do not perform as well as others expect me to do.”), two items related to lack of social recognition (e.g., “Although I give my best, I do not get enough recognition for what I am doing.”), and four items related to chronic worries (e.g., “I cannot suppress my worrying thoughts.”). Validity and internal consistency of this instrument have been previously established²⁹. For instance, the SCSS was strongly correlated with the Life Experiences Survey, the Perceived Stress Scale and the Perceived Stress Questionnaire²⁹. Answers were given on a 5-point Likert scale ranging from 1 (never) to 5 (very often), with higher scores indicating higher stress. As for all measures (see Table 1), the internal consistency of the SSCS was above the critical value of ≥0.70.

3) Sleep

Participants completed the Insomnia Severity Index (ISI)³⁰ to measure sleep complaints. The seven items of the ISI are answered on a 5-point rating scale from 0 (not at all) to 4 (very much). These items refer, in part, to DSM-IV criteria for insomnia by measuring difficulties falling asleep, difficulties maintaining sleep, early morning awakening, increased daytime sleepiness, low daytime performance, low satisfaction with sleep and worrying about sleep. Higher scores indicate more sleep complaints. Reliability and validity of the ISI has been established in prior research³¹.

4) Perceived fitness

Perceived physical fitness was measured with one item ranging from 1 (very poor fitness) to 10 (excellent fitness)³⁵. Concretely, participants were asked to respond to the following item: “Overall, how would you rate your physical fitness?” This measure has previously been demonstrated to be a valid indicator of perceived fitness, as it was highly correlated with the 12-item Perceived Physical Fitness scale³². Moreover, this measure has proved to be correlated with measures of objective physical fitness, perceived well-being and sleep³⁷,³². Nevertheless, the fact that the measure was only weakly associated with estimated VO₂max indicates that perceived fitness and objectively assessed fitness are distinct constructs.

5) Mental health

Mental health was measured with the psychological composite score of the 12-Item Short-Form Health Survey (SF-12), a frequently used measure for general population research. The SF-12 is capable of discriminating between participants with and without chronic conditions. The discriminatory power of the SF-12 is comparable to that of the 36-Item Short-Form Health Survey (SF-36)³³. The composite score for the mental health subscale was obtained by weighting each item as described in the SF-12 manual³⁰, with higher scores reflecting better mental health.

Statistical analyses

Three independent ANCOVAs were performed to compare groups of officers with differing stress, fitness and sleep levels using mental health as the outcome (Hypotheses 1–3). To classify police officers into groups with low, moderate and high fitness levels, we used categories derived from a previous study with university students³⁷. The cut-off scores were 0–5=low perceived fitness (n=186, 41%), 6–8=moderate perceived fitness (n=167, 37%) and 9–10=high perceived fitness (n=103, 23%); self-rated fitness level was missing for 4 officers. According to Morin et al.³⁴, the total scores of the Insomnia Severity Index should be interpreted as follows: absence of insomnia (0–7), subthreshold insomnia (8–14), moderate insomnia (15–21) and severe insomnia (22–28). To ensure that the categorization reflected a meaningful criterion and that each cell consisted of at least 10 participants in the three-way ANCOVA, participants were classified into two groups: 0–14=“good” sleepers (n=281, 61%) and ≥15=“poor” sleepers (n=179, 39%). With regard to self-reported stress, no given standards existed²⁹. To avoid a median split, we used the tertiles to obtain groups with approximately equal sizes. The cut-off scores used in the present study were: 0–9=low stress (n=155, 34%), 10–15=moderate stress (n=161, 35%) and 16–48=high stress (n=142, 31%); self-rated stress data were missing for 2 officers. Chi²-tests were carried out to determine how stress, perceived fitness and sleep were interrelated (Hypotheses 4–6). A multifactorial ANCOVA was performed with the SF-12 Mental Health subscale as the outcome variable. This calculation examined whether the relationship between stress and health was moderated by perceived fitness (Hypothesis 7), and whether this moderation is associated with sleep (Hypothesis 8). Descriptive statistics, Cronbach’s alpha coefficients and ANCOVAs were computed with SPSS 21 (IBM Corp., Armonk, NY, USA) for Mac®.
Results

Descriptive statistics and sociodemographic influences

Table 1 reports the descriptive statistics for stress, perceived fitness, sleep and mental health. Compared with male officers, women reported lower mental health \((F(1,449)=5.27, p<0.01, \eta^2=0.02)\). No significant gender effects were found for perceived stress, sleep complaints and perceived fitness. With increasing age, participants reported slightly higher mental health \((r=0.11, p<0.05)\) and lower perceived fitness \((r=-0.22, p<0.001)\). Age was related to neither stress nor sleep complaints. Shift workers reported more sleep complaints \((F(1,459)=4.53, p<0.01, \eta^2=0.02)\) and increased fitness \((F(1,455)=13.94, p<0.001, \eta^2=0.03)\). BMI was significantly associated with mental health \((r=-0.15, p<0.01)\) and perceived physical fitness \((r=-0.38, p<0.001)\), whereas no significant relationships existed with stress and sleep. Level of education, smoking and alcohol consumption were not associated with any of the study variables. Thus, since gender, age, BMI and shift status were significantly associated with at least one of the main study variables, these factors were considered to be covariates during hypotheses testing for Hypotheses 1−3 and 7–8.

Hypothesis 1−3. Group differences in mental health status based on participants’ stress, perceived fitness, and sleep

Table 2 shows that after controlling for gender, age, BMI and shift status, there were significant differences in the mental health of officers with varying stress levels (Hypothesis 1). Bonferroni post hoc tests revealed significant differences between all groups \((p<0.001)\) and that higher stress scores related to decreased mental health scores. A significant main effect was also observed for perceived fitness (Hypothesis 2). The findings delineate that officers with high perceived fitness levels had the highest mental health scores.

Finally, a significant group difference in mental health existed between participants with good and poor sleep (Hypothesis 3). Thus, participants with moderate to severe insomnia scores reported lower mental health than counterparts with low scores (Table 2). In summary, the results support the first

| Table 1. Descriptive statistics for study variables |
|-----------------|------|-----|-----|------|--------|--------|
|                 | N    | M   | SD  | Range | Kurtosis | Skewness |
| Perceived stress (SSCS) | 458  | 12.97 | 7.07 | 0–42  | 0.77    | 0.74    |
| Sleep complaints (ISI)    | 460  | 14.02 | 4.82 | 7–31  | 0.69    | 0.93    |
| Mental health (SF-12)     | 450  | 50.60 | 8.40 | 21.62–62.13 | 1.25 | -1.27 |
| Perceived fitness        | 456  | 6.00  | 1.83 | 1–10  | -0.12   | -0.34   |

Variations in the number of cases depend on missing values for the various scales. SSCS=chronic stress screening scale. ISI=Insomnia Severity Index. SF-12=12-item short-form health survey.

| Table 2. Group differences in mental health between participants with differing stress levels, perceived fitness and quality of sleep |
|-----------------|-----|-----|-----|-----|-----|
| SF12-Mental health | M   | SD  | F   | p   | \(\eta^2\) |
| Stress          |     |     |     |     |     |
| Low             | 55.67 | 4.01 | 101.59 | <0.001 | 0.315 |
| Moderate        | 51.35 | 6.91 |       |     |     |
| High            | 44.30 | 9.40 |       |     |     |
| Perceived fitness |     |     |     |     |     |
| Low             | 49.97 | 9.19 | 5.67  | <0.01 | 0.025 |
| Moderate        | 50.27 | 8.04 |       |     |     |
| High            | 52.10 | 7.36 |       |     |     |
| Sleep           |     |     |     |     |     |
| Poor            | 46.60 | 9.52 | 85.16 | <0.001 | 0.161 |
| Good            | 53.19 | 6.39 |       |     |     |

BMI=Body Mass Index. All analyses controlled for gender, age, BMI and shift status. SF-12=12-item short-form health survey.
three hypotheses, indicating that mental health is associated with the stress level, perceived fitness and sleep quality of police officers.

**Hypothesis 4−6. How are stress, perceived fitness and sleep interrelated?**

To test whether high stress was associated with poor sleep (Hypothesis 4), we examined if poor sleepers were overrepresented among participants with moderate and high stress levels. Table 3 validated this assumption by identifying a linear relationship between self-reported stress and quality of sleep.

Further, Table 3 shows that perceived fitness was associated with perceived stress (Hypothesis 5). Individuals who reported high stress scores were more likely to report low, rather than high, fitness levels.

Although the findings pointed in the expected direction, no significant association existed between perceived fitness and sleep (Hypothesis 6).

In summary, the results accord with our second set of hypotheses stating that self-reported stress, perceived fitness and sleep are interrelated among police officers. Contrary to our hypothesis, however, no significant association occurred between perceived fitness and sleep.

**Hypothesis 7−8. Does perceived fitness protect against stress-related mental health impairments, and is the stress-buffering effect related to participants’ sleep?**

Table 4 summarizes the findings of the multifactorial ANCOVA with stress, perceived fitness and sleep as fixed factors. After controlling for gender, age, BMI and shift status, two significant main effects were found for stress and sleep. The effect size for stress was high (20.7% of explained variance), whereas the one for sleep was weak to moderate (7.2% of explained variance). Figure 1 corroborates that participants who reported high stress and perceived poor sleep had lower mental health scores.

Additionally, a significant two-way interaction was observed between stress and sleep, but not between the other variables. As illustrated in Fig. 1, participants with high perceived stress self-reported higher mental health if they perceived good versus poor sleep. However, the differences between good and poor sleepers are of minor magnitude under low and moderate stress conditions. In contrast, there was no support for Hypothesis 7, which posited that perceived fitness moderates the relationship between stress and mental health, independent of sleep. Rather, Table 4 suggests that the stress-buffering potential of perceived fitness is associated with participants’ sleep.

When good sleep was reported, high perceived fitness protected against low mental health (Fig. 2). Thus, among good sleepers, participants with high perceived fitness levels had relatively high mental health scores despite reporting high stress. This was not the case among participants with low or moderate fitness perceptions. Among poor sleepers, mental health linearly decreases with increasing stress, independent of perceived fitness.

In summary, our data showed no support for perceived fitness as a direct stress-buffer (Hypothesis 7). Our findings suggested, however, that the stress-buffering potential of perceived fitness is related to sleep quality. Instead of finding a fitness-based stress-buffering effect among participants who reported multiple risk factors (Hypothesis 8: high stress and poor sleep), our data unravelled that perceived fitness protected against impaired mental health only among participants who reported good sleep.

**Discussion**

The key findings of the present study are that high stress was more closely related to low mental health among poor sleepers and that perceived fitness protected against stress-related mental health impair-
Eight hypotheses were formulated in total, and these will now be discussed in sequence. This study confirmed the first hypothesis: Stress is associated with impaired self-perceived mental health. This coincides with prior research regarding the relationship between stress and mental health among police officers\(^21\). The effect size points towards a strong link between self-reported stress and mental health. Consequently, stress management is a vital issue among police officers, especially since police work is considered more stressful than other professions\(^21\).

Support was also found for the second hypothesis: High levels of perceived fitness were associated with increased mental health\(^22\). This parallels previous studies showing that high aerobic fitness protects against symptoms of burnout and depression\(^12, 13\). Our results also support a significant link between perceived fitness and mental health indicators\(^13, 32\).

Our third hypothesis was maintained. It proposed that sleep problems were related to lower perceived mental health. Analogous to prior research\(^23, 31\), officers with sleep complaints reported lower mental health scores. Poor sleep may affect health through multiple behavioral, physiological and neurobiological changes\(^35\). For instance, sleep loss has been associated with reduced work performance\(^26\) and changes in HPA axis activity\(^36\).

The fourth hypothesis was sustained: High stress was associated with increased sleep complaints\(^24\). This relationship was attributed to both cognitive factors as well as neurophysiological changes\(^35\). For example, stress exposure may impede sleep onset by increasing cognitive and somatic arousal. In particular, one study posits that intrusive thoughts associated with past stress could elicit worries about being unable to fall asleep and the potential consequences of a sleep deficit\(^37\).

To reinforce Hypothesis 5, perceived fitness was significantly associated with self-reported stress. This is congruent with field studies showing that regular exercise is associated with reduced levels of stress\(^25\). It further confirms laboratory studies that found

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### Table 4. Group differences in mental health depending on participants’ stress, perceived fitness and sleep

<table>
<thead>
<tr>
<th>SF-12 Mental Health</th>
<th>Model 1: Unadjusted</th>
<th>Model 2: Controlled for gender, age, BMI and shift status</th>
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<tbody>
<tr>
<td></td>
<td>F</td>
<td>p</td>
</tr>
<tr>
<td>Gender</td>
<td>0.06</td>
<td>ns</td>
</tr>
<tr>
<td>Age</td>
<td>6.28</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>BMI</td>
<td>7.58</td>
<td>ns</td>
</tr>
<tr>
<td>Stress</td>
<td>55.53</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Fitness</td>
<td>0.10</td>
<td>ns</td>
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<tr>
<td>Sleep</td>
<td>29.30</td>
<td>&lt;0.001</td>
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<tr>
<td>Stress × Fitness</td>
<td>0.20</td>
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<tr>
<td>Stress × Sleep</td>
<td>5.51</td>
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<td>Fitness × Sleep</td>
<td>2.49</td>
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<tr>
<td>Stress × Fitness × Sleep</td>
<td>4.40</td>
<td>&lt;0.01</td>
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BMI=Body Mass Index. SF-12=12-item short-form health survey.
reduced stress reactivity among participants with high exercise or fitness levels\textsuperscript{38}. Moreover, this finding accords with the notion that self-rated fitness is negatively related to daily stress\textsuperscript{15}. Also, perceived fitness explains significant variance in the psychological and physiological reactivity to laboratory stress beyond that attributable to estimated aerobic physical fitness\textsuperscript{18, 32}. Nevertheless, it must be highlighted that our study could not show that perceived fitness is a better explanatory variable than objectively assessed fitness, as objective fitness was not assessed.

Our sixth hypothesis was not confirmed. High perceived fitness was not associated with good sleep. This is at odds with a Swiss college student study, which indicated that the relationship between exercise and sleep might be a “mental affair” that is more related to the perceptions of one’s exercise involvement than the behavior itself\textsuperscript{17}. The diverging findings may be attributable to the fact that a previously established cut-off was used in the present study to distinguish between “good” and “poor” sleepers, whereas in the college student study, sleep was used as a continuous variable.

Finally, no support was found for Hypothesis 7, which assumed a direct fitness-based stress-buffer effect. Scientists argued that an active leisure style can operate as a buffer against stress to maintain physical and mental health by providing feelings of self-determination, social support or a mindset of mental toughness\textsuperscript{19}. A recent review, however, showed that the stress-buffer hypothesis associated with exercise and fitness was only supported in about half of the existing studies\textsuperscript{14}. Perhaps these inconsistencies are due to extraneous factors such as impaired sleep. This study reveals, for the first time, that perceived fitness operates as a stress-resilience resource among participants who perceive good sleep (Hypothesis 8). This finding alludes to the notion that high stress exposure combined with poor sleep is too heavy a burden for a single protective factor (perceived fitness) to counteract the negative corollaries of stress. Furthermore, the serious consequences of multiple risk factor exposure are well known from childhood psychopathology. For instance, a study showed that for each additional risk factor, the odds of a psychiatric diagnosis increased by 20% among children with depressed mothers\textsuperscript{40}.

This research extends into broader areas. It dovetails with studies showing that the risk for the metabolic syndrome is substantially increased among individuals who accumulate several risk factors\textsuperscript{41}. In an occupational setting, this underlines the importance of multimodal interventions that (i) focus on more than one risk factor and (ii) are tailored towards employee needs and may include stress management, sleep hygiene and fitness training, for example. Importantly, a recent pilot study showed that such a multiple risk factor intervention is feasible within the healthcare system and was agreeable with participants\textsuperscript{42}.

The present study expands extant research by focusing on perceived fitness as a stress-resilience resource and testing the stress-buffering hypothesis for two combined risk factors. Even though fitness was assessed via self-report, perceived fitness was correlated with objectively measured fitness and self-reported leisure-time exercise in prior research\textsuperscript{43}. Moreover, the relatively large sample size allowed calculation of three-way interactions between stress, fitness and sleep. Finally, it is noteworthy that this study emphasized chronic perceived stress, since Berg et al.\textsuperscript{21} argued that police officers are better prepared to face operational stressors, whereas the skills to manage organizational stressors are less developed.

Notwithstanding the strengths of our study, the present investigation has four major limitations. First,
the cross-sectional design does not allow a causal interpretation of the data. Second, all variables were assessed with subjective self-report measures. Third, the response rate was below 50 percent. However, this response rate is comparable to other published police force studies\(^3\). Fourth, we did not control for psychiatric disorders or the intake of psychopharmacological substances.

**Conclusions and Practical Implications**

From an applied point of view, the results demonstrate that stress prevention, coping skills training and sleep hygiene should be incorporated into workplace health promotion programs of police departments. Additionally, in a police setting, good fitness is important since, high agility and physical readiness are fundamental in dealing with unpredictable and violent situations. Nevertheless, our findings suggest that fitness training alone is insufficiently effective for all employees but that individually tailored treatments focusing on more than one risk factor may exude more beneficial outcomes.

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**Conflicts of interest:** All authors declare that there are no conflicts of interest.

**References**

20. Brand S, Gerber M, Hatzinger M, Beck J, Pühse U, Holsboer-Trachsler E. High exercise levels are


