

Anxiety, depression symptoms, and physical activity levels of eutrophic and excess-weight Brazilian elite police officers: a preliminary study

Rodrigo L Vancini¹
 Claudio AB de Lira²
 Sarah A Anceschi¹
 André V Rosa¹
 Ana P Lima-Leopoldo¹
 André S Leopoldo¹
 Weverton Rufo-Tavares¹
 Marília S Andrade³
 Pantelis T Nikolaidis⁴
 Thomas Rosemann⁵
 Beat Knechtle⁵

¹Departamento de Desportos, Centro de Educação Física e Desportos, Universidade Federal do Espírito Santo, Vitória, Brazil; ²Sector de Fisiologia Humana e do Exercício, Faculdade de Educação Física e Dança, Universidade Federal de Goiás, Goiânia, Goiás, Brazil; ³Departamento de Fisiologia, Universidade Federal de São Paulo, São Paulo, Brazil; ⁴Exercise Physiology Laboratory, Nikaia, Greece; ⁵Institute of Primary Care, University of Zurich, Zurich, Switzerland

Background: Police officers are subjected to high work-related stress. This scenario of irregular and insalubrious working conditions may be related to an increase in psychiatric disorders and overweight. In particular, low levels of physical activity and high work stress levels may predispose police officers to obesity, poor lifestyles, and, consequently, major risk of psychological disorders. Thus, our aim was to profile the anxiety/depression symptoms and habitual physical activity (HPA) levels of Brazilian elite police officers classified by body mass index (BMI).

Patients and methods: Eighty-seven male police officers classified as normal-weight (NG, BMI =18.5–24.9 kg/m², n=34) and excess-weight (EG, BMI ≥25 kg/m², n=53) completed (before work routine time) the questionnaires: Baecke (HPA levels), State-Trait Anxiety Inventory (anxiety), and Beck Depression Inventory (depression).

Results: There was a slight trend (despite did not reach statistical significance) of the EG group (which have a significantly [$P=0.0369$] higher mean [8.8 ± 7.6] of military service time [in years] when compared to NG group [5.8 ± 6.0]) presenting higher values of anxiety-trait (+5.0%) and depression (+16.0%) and lower levels of leisure time HPA (–3.7%) than NG group.

Conclusion: Although our hypothesis was not ratified, our findings have clinical relevance because we profiled the anxiety and depression symptoms and HPA levels of elite police officers. Moreover, it is possible to suppose that the military service time (years) is a relevant factor, that it needs to be studied in depth, and that it may impact the predisposition for mood disorders and low levels of physical activity of police officers.

Keywords: depression, mood state, physical activity, physical exercise, physical fitness, police officers

Introduction

Police officers are subjected to high work-related stress.^{1,2} This scenario of irregular and often insalubrious working conditions (shift work, long working time, and unfavorable lifestyles such as physical inactivity) may be related to an increase in cardiovascular diseases and other morbidities in this population.¹ Indeed, it has been documented that long work hours and exposure to several extrinsic and intrinsic stressors are associated with hypertension, dyslipidemia, diabetes, psychiatric disorders, and overweight among police officers.^{1,3–5} In particular, low levels of physical activity and high work stress levels may predispose police officers to obesity, poor lifestyles, and, consequently, major risk of psychological disorders.³

In this context, Can and Hendy² evaluated non-obese and obese police officers (classified by body mass index [BMI]) and showed that strength-training levels were significantly lower in obese than non-obese police officers. In addition, Garbarino and

Correspondence: Rodrigo L Vancini
 Departamento de Desportos, Centro de Educação Física e Desportos, Universidade Federal do Espírito Santo, Campus Universitário, Av. Fernando Ferrari, 514, CEP: 29075810, Goiabeiras, Vitória, Espírito Santo, Brazil
 Tel +55 27 4009 2624
 Email rodrigoluvancini@gmail.com

Magnavita⁴ demonstrated an association between occupational stress and metabolic syndrome. These authors showed that police officers with higher stress levels had significantly higher levels of triglycerides and lower levels of high-density lipoprotein cholesterol.

Because of their stressful work routines, police officers are more vulnerable to poor lifestyles and sedentary behavior. This may predispose them to greater risk of obesity and associated morbidities. Although slightly under-studied, mood disorders may be somewhat recurrent and associated with overweight and lifestyle. Based on this information, BMI can be considered a good, accessible, and high ecological validity measurement due to its low cost, easy application and interpretation, and great use in the field of public health to track changes in body composition and degree of adiposity.⁶ In addition, monitoring and evaluation of BMI could favor studies about police officers since these professionals, in general, have extreme occupational and work demands and little time available to take care of their health. Despite the importance of their work to society, police officers have little time to manage their own health. In this sense, poor lifestyle, represented by low levels of physical activity and unbalanced diets, may predispose them not only to diseases but also to the risk of premature death. In order to perform their work, they need to have high levels of physical fitness to be healthy.^{1,2,4,5,7,8}

Although previous studies have demonstrated an association between obesity and mood disorders in police officers, to the best of our knowledge, no research has jointly evaluated the levels of depression and anxiety (trait and state) symptoms, physical activity levels (before work routine time), and their possible interactions in elite police officers. Considering the large number of those working as police officers and the specific psychophysiological demands of this job, this topic is of great practical/clinical interest for health professionals working with them in order to develop optimal psychological status, exercise programs, and lifestyle. Thus, the aim of the present study was to describe anxiety and depression symptoms and the levels of habitual physical activity (HPA), and their interactions in male Brazilian elite police officers of the battalion of special missions (who routinely deal with extremely complex and hostile situations), classified according to BMI. It is reasonable to suppose that excess-weight and obese police officers present higher levels of depression and anxiety and lower levels of HPA when compared with police officers with normal BMIs.

Patients and methods

Participants

This was a cross-sectional study that included 87 military police officers from the State of Espírito Santo (Brazil). All

participants took part in the Special Missions Battalion of Vitória, Espírito Santo, Brazil. Briefly, this battalion is considered a shock and elite force working on hostile missions (and involving the disturbance of public and social order) such as the reintegration of occupied lands, occupations of public roads, negotiations on suicide attempts and kidnappings, and rebellions. The police officers were classified into two groups according to BMI: normal-weight (NG, BMI = 18.5–24.9 kg/m²) and excess-weight (including obese; EG, BMI ≥ 25 kg/m²) groups.⁶ Police officers who worked only in administrative functions were excluded. After a clear explanation of the procedures, including the risks and benefits of participation, written consent was obtained. All experimental procedures were performed in accordance with the principles outlined in the Declaration of Helsinki and approved by the University Human Research Ethics Committee (UFES, Brazil) under number 2.182.185 (CAAE: 63228115.0.0000.5542).

Study design

The research consisted of the evaluation by questionnaires of anxiety, depression, and habitual levels of physical activity. The questionnaires were administered in the working environment between September 13 and 16, 2016, before the beginning of the work routine.

Assessment of anxiety levels

To assess the anxiety levels the Portuguese version of State-Trait Anxiety Inventory was used.⁹ Briefly, the questionnaire consists of two different scales of anxiety, one that evaluates state and another that evaluates trait. The trait-scale consists of 20 statements related to how the participants usually feel, and the state-scale consists of 20 statements regarding the current situation of the participants. Both the scales classify the participant as having low, medium, or high level of anxiety. Scores can vary from 20 to 80. A score ≤ 30 indicates a low level of anxiety, a score between 31 and 49 a medium level, and a score ≥ 50 a high level of anxiety.¹⁰ Internal consistency coefficients for the scale range from 0.86 to 0.95; and test-retest reliability coefficients range from 0.65 to 0.75 over a 2-month interval.¹¹

Assessment of depression levels

To assess the levels of depression, the Beck Depression Inventory (BDI), translated and adapted to Brazilian Portuguese by Gorenstein and Andrade,¹⁰ was used. BDI is one of the most frequently used questionnaires to evaluate the severity of depressive symptoms. This instrument has 21 questions about the symptoms of depression that cover

affective, behavioral, somatic, and interpersonal aspects. Each item consists of a series of four statements scaled to indicate increasing depressive symptomatology. The classification of the score ranges from normal to mild, mild to moderate, and moderate to severe depression. Scores <9 are considered normal, whereas scores between 10 and 18 indicate mild to moderate depression, 19–29 indicate moderate to severe depression, and 30–63 severe depression. Internal consistency of BDI ranges from 0.81 (for students) to 0.88 (for depressed patients).^{10,12}

Assessment of HPA levels

To assess the habitual levels of physical activity of the participants, the Baecke questionnaire was used. This is an instrument that requires participants to recall activities during the past 12 months, and it consists of 16 questions that include 1) occupational physical activity (OPA) score – 8 questions; 2) sportive physical activity (SPA) score – 4 questions; and 3) leisure time physical activity (LPA) score – 4 questions. The total score for HPA is the sum of the scores for OPA, SPA, and LPA. The higher the score achieved, the higher the level of HPA. Test–retest reliability of the OPA, SPA, and LPA scores were 0.88, 0.81, and 0.74, respectively.¹³

Statistical analyses

The data were presented by the mean, median, SD, minimum and maximum, and relative frequency (%). Kolmogorov–Smirnov test was used to verify the distribution of normality of the data. When the data presented normal distribution (age, body mass, stature, and BMI), *t*-test for unpaired samples was used. Conversely, when the data did

not present normal distribution (time of service and levels of anxiety, depression, and HPA), Mann–Whitney *U* test was used. Spearman test (ρ) was used to establish a correlation between BMI and variables obtained from the questionnaires. The level of significance adopted in all analyses was 5%, with a 95% confidence interval. The GraphPad Prism (version 6, GraphPad Software, Inc., La Jolla, CA, USA) software was used for analysis. In addition, we calculated the value of Cohen's *d* and the effect size (ES). The measures of the ES for differences were calculated using the means and SD of the NG vs EG groups. The magnitude of the ES was judged according to the following criteria: $d=0.2$ was considered a “small” ES; 0.5 represented a “medium” ES; and 0.8 a “large” ES.¹⁴

Results

Table 1 shows the general characteristics of the groups (NG [$n=34$] and EG [$n=53$]). Significant differences were observed in the following variables when comparing NG and EG groups: age ($P=0.0100$), body mass ($P<0.0001$), BMI ($P<0.0001$), and time of military service ($P=0.0369$).

The anxiety, depression, and physical activity levels are shown in Tables 2 and 3. There were no statistically significant differences between the groups.

For the NG group, ~20.5% ($n=7$) presented low, 73.5% ($n=25$) medium, and 5.8% ($n=2$) high levels of anxiety-trait. Regarding the classification of anxiety-state, 11.7% ($n=4$) presented low, 67.6% ($n=23$) medium, and 20.5% ($n=7$) high levels. For depression classification, 55.8% ($n=19$) were normal, 20.5% ($n=7$) presented mild depression, 14.7% ($n=5$) mild to moderate depression, and 8.8% ($n=3$) moderate to severe depression levels.

Table 1 General characteristics of the groups with normal (NG) body mass index (BMI) and excess-weight (EG)

	General data ($n=87$)	NG ($n=34$)			EG ($n=53$)			% of difference NG vs EG
	Mean \pm SD	Mean \pm SD	Median [P25–P75]	Min–Max	Mean \pm SD	Median [P25–P75]	Min–Max	
Age (years)	32.2 \pm 7.1	29.8 \pm 6.1	28.0 [26.0–31.2]	22.0–45.0	33.8 \pm 7.4 ($P=0.0100$)	32.0 [29.0–40.5]	22.0–48.0	+11.8
Body mass (kg)	82.3 \pm 10.9	74.8 \pm 6.8	74.0 [70.0–78.2]	64.0–89.0	87.0 \pm 10.5 ($P<0.0001$)	84.0 [79.50–94.50]	70.0–118.0	+14.0
Height (m)	1.77 \pm 0.06	1.78 \pm 0.06	1.78 [1.74–1.81]	1.65–1.90	1.77 \pm 0.06 ($P<0.0001$)	1.76 [1.72–1.80]	1.65–1.94	–0.5
BMI (kg/m ²)	26.0 \pm 2.8	23.5 \pm 1.3	23.8 [23.0–24.6]	19.5–24.9	27.6 \pm 2.3 ($P<0.0001$)	27.0 [25.7–29.0]	25.1–34.7	+14.8
Military service time (years)	7.6 \pm 7.1	5.8 \pm 6.0	3.0 [2.7–7.0]	1.0–23.0	8.8 \pm 7.6 ($P=0.0369$)	5.0 [3.0–18.0]	1.0–5.0	+34.1

Note: Statistically significant difference in relation to the mean of NG BMI group (*P*-value); % of difference: NG vs EG (relative to mean).

Table 2 Anxiety and depression levels of elite police officers with normal (NG) body mass index (BMI) and excess-weight (EG)

	General data (n=87)	NG (n=34)			EG (n=53)			Cohen's d	% of difference NG vs EG
	Mean \pm SD	Mean \pm SD	Median [P25–P75]	Min–Max	Mean \pm SD	Median [P25–P75]	Min–Max		
Anxiety-trait	38.6 \pm 8.2	37.4 \pm 8.1	36.0 [32.7–43.2]	23.0–56.0	39.4 \pm 8.3	39.0 [33.5–44.5]	22.0–60.0	0.24	+5.0
Anxiety-state	42.0 \pm 9.3	42.0 \pm 10.6	40.5 [33.7–49.2]	23.0–70.0	42.0 \pm 8.5	42.0 [36.5–48.5]	27.0–62.0	0	0
Depression	11.5 \pm 6.0	10.3 \pm 5.7	8.5 [6.0–15.2]	0.0–23.0	12.3 \pm 6.1	11.0 [8.0–17.0]	3.0–28.0	0.34	+16.2

Note: % of difference: NG vs EG (relative to mean).

Table 3 Levels of habitual physical activity of elite police officers with normal (NG) body mass index (BMI) and excess-weight (EG)

	General data (n=87)	NG (n=34)			EG (n=53)			Cohen's d	% of difference NG vs EG
	Mean \pm SD	Mean \pm SD	Median [P25–P75]	Min–Max	Mean \pm SD	Median [P25–P75]	Min–Max		
Occupational	3.4 \pm 0.3	3.4 \pm 0.3	3.3 [3.1–3.6]	2.7–4.2	3.4 \pm 0.3	3.50 [3.2–3.7]	2.7–4.3	0	0
Sportive	3.4 \pm 0.6	3.4 \pm 0.6	3.3 [2.9–4.0]	2.2–5.0	3.4 \pm 0.6	3.50 [3.0–4.0]	2.0–4.7	0	0
Leisure time	2.6 \pm 0.6	2.7 \pm 0.7	2.7 [2.2–3.3]	1.5–4.2	2.6 \pm 0.6	2.7 [2.1–3.0]	1.2–4.0	0.15	–3.7
Absolute	9.6 \pm 1.1	9.6 \pm 1.2	9.9 [8.5–10.3]	7.0–12.1	9.6 \pm 1.0	9.6 [8.7–10.3]	7.3–11.7	0	0
Mean	3.2 \pm 0.3	3.2 \pm 0.4	3.3 [2.8–3.4]	2.3–4.0	3.2 \pm 0.3	3.2 [2.9–3.4]	2.4–3.9	0	0

Note: % of difference: NG vs EG (relative to mean).

Considering the BMI group with excess-weight, ~15.0% (n=8) presented low, 69.8% (n=37) medium, and 15.0% (n=8) high levels of anxiety-trait. Regarding the classification of anxiety-state, 9.4% (n=5) presented low, 69.8% (n=37) medium, and 20.7% (n=11) high levels. For the depression classification, 33.9% (n=18) were normal, 37.7% (n=20) presented mild depression, 13.2% (n=7) mild to moderate depression, and 15.0% (n=8) moderate to severe depression.

When correlating BMI with the variables of the questionnaires, the following results were observed: anxiety-trait ($\rho=0.15$, $P=0.18$), anxiety-state ($\rho=0.11$, $P=0.32$), depression ($\rho=0.15$, $P=0.16$), HPA (occupational [$\rho=0.21$, $P=0.04$], sportive [$\rho=-0.05$, $P=0.67$], leisure time [$\rho=-0.08$, $P=0.44$], absolute [$\rho=-0.022$, $P=0.84$], mean [$\rho=-0.023$, $P=0.83$]), and service time ($\rho=0.37$, $P=0.0004$).

Discussion

Our main aim was to profile anxiety, depression, and HPA levels in male elite police officers according to BMI before

work routine time. When comparing these data together, Brazilian elite police officers (n=87) presented moderate levels of anxiety-trait/state and mild depression. When comparing groups (NG vs EG), our findings did not reveal significant differences regarding anxiety, depression, and HPA levels. However, there was a slight tendency of the EG group to present higher mean values of trace anxiety and depression and lower levels of leisure time physical activity. In addition, EG group presented a significantly higher mean time of military service, which could, supposedly, impact on mental health.

In general, police officers with operational function (that is the case of our sample) are subjected to permanent emotional tension and a slight degree of mood disorder, which have connections to the nature of the police occupational routine. Excessive and exhausting occupational stress can trigger psychological disturbances, negatively impact mental health, and, consequently, professional performance of police officers. Price¹⁵ pointed out that police officers across the world are subjected to traumatic incidents and later

psychiatric consequences, including an increased risk for stress-related medical conditions and depression.

In our study, regarding the classification of the depression levels, 8.8% of the NG and 15.0% of the EG groups presented moderate to severe depression levels. Concerning the classification of anxiety - trait and state, for NG (5.8% and 20.5%) and EG (15.0% and 20.7%) presented high levels, respectively.

Nieuwenhuys and Oudejans¹⁶ showed that high levels of anxiety had a negative effect on shot accuracy. This condition could put the society that the police officer aims to protect from urban violence at risk. The anterior findings need to be highlighted and carefully analyzed and treated in a personified and individual way because it is not uncommon for military police officers to commit suicide due to poor mental health and psychological disorders.¹⁷

Another relevant point of our findings emerged when we compared total scores of HPA levels of Brazilian elite police officers with studies that analyzed excess-weight/obesity samples. The absolute scores for the NG and EG groups were 10.8% and 16.6%, respectively, higher when compared to adults (men/women – mean age of 30.3 years) classified by Berntzen et al¹⁸ in the groups leaner and heavier. In addition, the absolute score of our sample, regarding NG and EG groups was 21.8% higher when compared to obese men who were subjects of the multicenter European obesity project.¹⁹

Physical activity could be an alternative for health promotion in the police force.²⁰ MacMillan et al,²⁰ in a systematic review, verified that few studies have used a combination of structured programs with education and behavior change for police officers. From 21 studies analyzed, only three had long duration (≥ 6 months) and nine evaluated structured physical activity and/or diet programs, five studies used education and behavior change support-only interventions, five combined structured programs with education and behavior change support, and two studies used computer prompts to minimize sedentary behavior. It is already widely documented that the practice of physical activity could decrease and minimize the effects of high levels of anxiety.²¹ In this way, their systematic practice could contribute to the psychological health of police officers.

Another result that deserves attention is that the greater the time of service of the police officer, the greater the BMI (despite weak levels of correlation). This could indicate that the longer the time that military police officers devote to their work, the less they take care of their health. Many Brazilian military police officers need to do extra work to supplement their family income. In addition, the longer

the police corps time, the worse the BMI levels. We could hypothesize that overtime and through involvement with work, the police start to neglect their health. This happens in general in Brazil because to enter the police corps, the candidates are submitted to physical fitness tests, in which they need to reach a certain level, and after that there is no incentive and time in their exhausting work routines for practice or taking care of health/physical conditioning. da Silva et al²² conducted a study among 165 Brazilian military police officers and showed that high fat percentage, long years of service in the military police, long hours of work per day, and low leisure-time physical activity levels were risk factors for coronary disease among them. Finally, da Silva et al²² stated that local and global studies are needed for the purpose of proposing preventive and rehabilitation programs, which would result in providing physical activity to prevent obesity and improving the mental well-being of police officers. In this context, Acquadro Maran et al²³ evaluated the impact of courses (health promotion strategies), to improve the ability to manage and reduce distress, in an Italian police force. The courses included stimulating the improvement of physical efficiency (body conditioning) and wellness (autogenic training) classes with the aim to increase the use of the adaptive/positive coping strategies. The authors showed that physical/wellness courses affected the perceived distress of police officers and increased the well-being perception. The participants expressed having mental health benefits, and the use of adaptive/positive coping strategies increased.

Study limitations

It is important to point the limitations of the present study: first, the difficulty to establish a causal relationship between BMI and anxiety, depression, and HPA levels using a cross-sectional study. Moreover, there was no information about body fat and fat-free mass of the participants. The lack of relationship between BMI with psychological aspects and physical activity may be partially attributed to the increased fat-free mass of this special group of police officers. This suggests that an excess of body weight might result from high levels of fat-free mass instead of body fat, and future studies should address this issue. However, our study was carried out on a restricted and special sample (elite police officers).

In addition, future studies should employ a longer period, use a longitudinal design applied to police officers, include women who reportedly have higher levels of mood disorders, particularly depression, and in a larger samples (despite the difficulties of access in a real context, ie, before the police working time routine) that provides greater statistical power.

For example, Suzuki et al²⁴ reported that increased BMI was associated with increased harm avoidance and decreased self-directedness in the health of Japanese women but not in men. We can suppose that male police officers were less susceptible to the impact of BMI on psychological health than the police women would be. In the present study, the authors suggest a connection between increased BMI and poor mood state and that BMI and some personality traits (men vs women) are linked to depression, which are different between the sexes and associated with hormonal function and the production of neurotransmitters.

Moreover, it was observed that working time, shift work, career progression, overwork, and high levels of labor stress, of the police officers, were factors that promote changes in body composition and BMI and poor mental health. Thus, providing physical and mental well-being, improvements in the quality of life and prevention of overweight/obesity, of police officers, are important because this occupation requires physical fitness and good mental health.⁸

Finally, sociodemographic (marital status and number of children) and economic variables were not evaluated. These are factors that could increase a lot the levels of psychological/emotional stress and negatively impact mood state, as reported by other studies.^{25,26}

Nevertheless, we believe that these limitations do not decrease the value of the present study because our investigation was in a real-world setting (before work routine time of elite police officers) and have considerable ecological validity.

Conclusion

Our preliminary study demonstrates that excess-weight and BMI levels did not impact and cause changes in the psychological health and levels of HPA of male elite Brazilian police officers. Although we did not find significant differences between the variables, the EG group presents higher values of anxiety and depression and lower levels of physical activity in leisure time. Supposedly, our findings may be related to the longer time of military service (in years) of the EG group. However, it is necessary to test our findings on a larger sample size to get more statistical power.

Although we do not observe high ESs, in our study (we observed Cohen's d from 0.15 to 0.34), our results may have important implications for clinical decisions, since we establish the profile of Brazilian elite police officers who are exposed to situations of intense emotional stress. However, it is important to point that, with a Cohen's $d=0.2$, 58% of

the treatment group (EG group) will be above the mean of the control (NG group).¹⁴ This indicates that the proposed division of the groups (classification by BMI) had an impact on the studied variables.

Finally, our work opens up the possibility of studying in greater depth the relationship between the level of physical activity, BMI, and military service time, which supposedly could negatively impact the mental/psychological health of elite male police officers and consequently put them at risk of ill health, thus jeopardizing their on-the-job performance and their provision of service to society. However, in future studies, other factors also need to be considered, for example, biological, sociodemographic, economic, cultural, personality and psychological traits, and occupational function in the corporation.

Acknowledgments

We would like to thank all the police officers who volunteered their time to participate in the study and the Batalhão de Missões Especiais (BME) do Estado do Espírito Santo (ES, Brazil) and Fundação de Amparo à Pesquisa e Inovação do Espírito Santo (FAPES) for the financial support in research projects. Claudio Andre Barbosa de Lira had a fellowship from the Coordenação de Aperfeiçoamento de Pessoal de Ensino Superior, Programa Nacional de Pós-Doutorado (CAPES/PNPD – Coordination for the Improvement of Higher Education Personnel, National Postdoctoral Program, Brazil). The research was conducted at the Strength and Conditioning Laboratory (LAFEC) at CEFD/UFES, Brazil.

Disclosure

The authors report no conflicts of interest in this work.

References

1. Shiozaki M, Miyai N, Morioka I, et al. Assessment of the risk of ischemic heart disease and its relevant factors among Japanese police officers. *Sangyo Eiseigaku Zasshi*. 2013;55(4):115–124. Japanese.
2. Can SH, Hendy HM. Behavioral variables associated with obesity in police officers. *Ind Health*. 2014;52(3):240–247.
3. Violanti JM, Fekedulegn D, Andrew ME, Charles LE, Hartley TA, Burchfiel CM. Adiposity in policing: mental health consequences. *Int J Emerg Ment Health*. 2011;13(4):257–266.
4. Garbarino S, Magnavita N. Work Stress and Metabolic Syndrome in Police Officers. A Prospective Study. *PLoS One*. 2015;10(12):e0144318.
5. Magnavita N, Capitanelli I, Garbarino S, Pira E. Work-related stress as a cardiovascular risk factor in police officers: a systematic review of evidence. *Int Arch Occup Environ Health*. 2018;91(4):377–389.
6. World Health Organization (WHO). *Obesity: Preventing and Managing the Global Epidemic. Report of a World Health Organization Consultation*. Geneva: World Health Organization, WHO Obesity Technical Report Series; 2000:256–284.

7. Alasagheirin MH, Clark MK, Ramey SL, Grueskin EF. Body mass index misclassification of obesity among community police officers. *AAOHN J*. 2011;59(11):469–475.
8. Da Silva FC, Hernandez SS, Gonçalves E, Arancibia BA, da Silva Castro TL, da Silva R. Anthropometric indicators of obesity in policemen: a systematic review of observational studies. *Int J Occup Med Environ Health*. 2014;27(6):891–901.
9. Andrade L, Gorenstein C, Vieira Filho AH, Tung TC, Artes R. Psychometric properties of the Portuguese version of the State-Trait Anxiety Inventory applied to college students: factor analysis and relation to the Beck Depression Inventory. *Braz J Med Biol Res*. 2001;34:367–374.
10. Gorenstein C, Andrade L. Validation of a Portuguese version of the Beck Depression Inventory and the State-Trait Anxiety Inventory in Brazilian subjects. *Braz J Med Biol Res*. 1996;29(4):453–457.
11. Spielberger CD, Gorsuch RL, Lushene R, Vagg PR, Jacobs GA. *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press; 1983.
12. Beck AT, Rush AJ, Shaw BF, Emery G. *Cognitive Therapy of Depression*. New York: The Guilford Press; 1979.
13. Baecke JA, Burema J, Frijters JE. A short questionnaire for the measurement of habitual physical activity in epidemiological studies. *Am J Clin Nutr*. 1982;36(5):936–942.
14. Cohen J. *Statistical Power Analysis for the Behavioral Sciences Statistical Power Analysis for the Behavioral Sciences*. 2nd ed. Hillsdale, New Jersey: Lawrence Erlbaum Associates; 1988.
15. Price M. Psychiatric Disability in Law Enforcement Officers. *Behav Sci Law*. 2017;35(2):113–123.
16. Nieuwenhuys A, Oudejans RR. Training with anxiety: short- and long-term effects on police officers' shooting behavior under pressure. *Cogn Process*. 2011;12(3):277–288.
17. O'Hara AF, Violanti JM, Levenson RL Jr, Clark RG Sr. National police suicide estimates: web surveillance study III. *Int J Emerg Ment Health*. 2013;15(1):31–38.
18. Berntzen B, Jukarainen S, Kataja M, et al. Physical activity, cardiorespiratory fitness, and metabolic outcomes in monozygotic twin pairs discordant for body mass index. *Scand J Med Sci Sports*. 2018;28(3):1048–1055.
19. Tehard B, Saris WH, Astrup A, et al. Comparison of two physical activity questionnaires in obese subjects: the NUGENOB study. *Med Sci Sports Exerc*. 2005;37(9):1535–1541.
20. MacMillan F, Karamacoska D, El Masri A, et al. A systematic review of health promotion intervention studies in the police force: study characteristics, intervention design and impacts on health. *Occup Environ Med*. 2017;74(12):913–923.
21. Stubbs B, Koyanagi A, Hallgren M, et al. Physical activity and anxiety: A perspective from the World Health Survey. *J Affect Disord*. 2017;208:545–552.
22. da Silva FC, Hernandez SS, Arancibia BA, Castro TL, Filho PJ, da Silva R. Health-related quality of life and related factors of military police officers. *Health Qual Life Outcomes*. 2014;12:60.
23. Acquadro Maran D, Zedda M, Varetto A. Physical Practice and Wellness Courses Reduce Distress and Improve Wellbeing in Police Officers. *Int J Environ Res Public Health*. 2018;15(4):E578.
24. Suzuki A, Kamata M, Matsumoto Y, Shibuya N, Otani K. Increased body mass index associated with increased harm avoidance and decreased self-directedness in Japanese women. *J Nerv Ment Dis*. 2009;197(3):199–201.
25. Gomes AR, Afonso JM. Occupational Stress and Coping among Portuguese Military Police Officer. *Av Psicol Latinoam*. 2016;34(1):47–65.
26. Anshel MH, Brinthaup TM. An exploratory study on the effect of an approach-avoidance coping program on perceived stress and physical energy among police officers. *Psychology*. 2014;5(7):676–687.

Psychology Research and Behavior Management

Publish your work in this journal

Psychology Research and Behavior Management is an international, peer-reviewed, open access journal focusing on the science of psychology and its application in behavior management to develop improved outcomes in the clinical, educational, sports and business arenas. Specific topics covered in the journal include: Neuroscience, memory and decision making; Behavior

modification and management; Clinical applications; Business and sports performance management; Social and developmental studies; Animal studies. The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/psychology-research-and-behavior-management-journal>

Dovepress