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Prevalence of Metabolic Syndrome in Military Police Officers of São Paulo City: The Health Promotion in Military Police (HPMP) Study

Prevalência de Síndrome Metabólica em Policiais Militares da Cidade de São Paulo: Estudo de Promoção da Saúde na Polícia Militar (HPMP)

Prevalencia del Síndrome Metabólico en la Policía Militar de la Ciudad de São Paulo: Estudio sobre Promoción de la Salud de la Policía Militar (HPMP)

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Abstract
We determined the prevalence of metabolic syndrome (MetS) among military police officers (MPOs) from the radio patrol program of the Military Police of Sao Paulo State (PMESP). Towards this goal, we analyzed the following characteristics: shift duty (daytime or nighttime patrol), service length in the PMESP, education level attained, weekly alcohol consumption, smoking, and physical activity of 93 MPOs. The MPO groups were created based on work shift [daytime (n=48) or nighttime (n=45)], and years of MPO experience [≤3 years (n=48) or ≥10 years (n=45)]. The overall prevalence of MetS among the 93 MPOs was 43%. There was a higher prevalence of MetS in the group with ≥ten years (53.3%) than that with ≤three years (33.3%); so, 1,6 times higher. The more prevalent MetS indicators (n=93) included waist circumference (76.3%), hypertension (55.9%), reduced plasma HDL-cholesterol levels (44%), hypertriglyceridemia (32.2%), and hyperglycemia (20.4%). Greater waist circumference, hypertension, hypertriglyceridemia, higher glycated hemoglobin A1c (HbA1c) levels, and MetS itself were associated with the service length (*i.e.*, ≥ten years). The work shift was not associated with any MetS indicator. Those who were overweight or obese were 2.2. times more likely to develop MetS. Hypertriglyceridemia, the best indicator of the MetS, increased the chance of developing MetS by 16 times. *Conclusion:* MPOs exhibit a high prevalence of MetS, associated with the years of service and age.
Keywords: Policeman; Hypertension; Obesity; Dyslipidemia; Police activity.

Resumo
Determinamos a prevalência de síndrome metabólica (SM) em policiais militares (PMs) do programa de radiopatrulhamento da Polícia Militar do Estado de São Paulo (PMESP). Para tanto, foram analisadas as seguintes características: Período de serviço (patrulha diurna ou noturna), tempo de serviço na PMESP, escolaridade, consumo semanal de álcool, tabagismo e atividade física de 93 PMs. Os grupos de PMs foram criados com base no turno de trabalho [diurno (n = 48) ou noturno (n = 45)] e anos de experiência na PM [≤3 anos (n = 48) ou ≥10 anos (n = 45)]. A prevalência geral de SM entre os 93 PMs foi de 43%. Houve uma prevalência maior de SM no grupo com ≥10 anos (53,3%) do que naquele com ≤3 anos (33,3%); então, 1,6 vezes maior. Os indicadores de SM mais prevalentes (n = 93) incluíram circunferência da cintura (76,3%), hipertensão (55,9%), níveis plasmáticos de HDL-colesterol reduzidos (44%), hipertrigliceridemia (32,2%) e hiperglicemia (20,4%). Maior circunferência da cintura, hipertensão, hipertrigliceridemia, níveis mais elevados de hemoglobina glicada A1c (HbA1c) e a própria SM foram associados ao tempo de serviço (ou seja, ≥10 anos). O turno de trabalho não foi associado a nenhum indicador de SM. Aqueles que estavam com sobrepeso ou obesos tinham 2,2 vezes mais probabilidade de desenvolver SM. A hipertrigliceridemia, o melhor indicador da SM, aumentou a chance de desenvolver SM em 16 vezes. Conclusão: PMs exibem uma alta prevalência de SM, que está associada com o tempo de serviço e idade.
Palavras-chave: Policiais; Hipertensão; Obesidade; Dislipidemia; Atividade policial.

Resumen

Determinamos la prevalencia del síndrome metabólico (MetS) entre policías militares (MPO) del programa de radiopatrullas de la Policía Militar del Estado de Sao Paulo (PMESP). Para ello, se analizaron las siguientes características: turno de turno (patrulla diurna o nocturna), duración del servicio en el PMESP, nivel educativo alcanzado, consumo semanal de alcohol, tabaquismo y actividad física de 93 MPO. Los grupos de MPO se crearon en función del turno de trabajo [diurno (n = 48) o nocturno (n = 45)] y años de experiencia de MPO [≤3 años (n = 48) o ≥10 años (n = 45)]. La prevalencia general de MetS entre las 93 MPO fue del 43%. Hubo una mayor prevalencia de MetS en el grupo con ≥ diez años (53,3%) que en el grupo con ≤ tres años (33,3%); entonces, 1,6 veces mayor. Los indicadores de MetS más prevalentes (n = 93) incluyeron circunferencia de la cintura (76,3%), hipertensión (55,9%), niveles reducidos de colesterol HDL en plasma (44%), hipertrigliceridemia (32,2%) e hiperglucemia (20,4%). Una mayor circunferencia de la cintura, hipertensión, hipertrigliceridemia, niveles más altos de hemoglobina glucosilada A1c (HbA1c) y el propio MetS se asociaron con la duración del servicio (es decir, ≥ diez años). El turno de trabajo no se asoció con ningún indicador MetS. Los que tenían sobrepeso u obesidad eran 2,2. veces más probabilidades de desarrollar MetS. La hipertrigliceridemia, el mejor indicador del MetS, aumentó 16 veces la posibilidad de desarrollar MetS. Conclusión: las MPO exhiben una alta prevalencia de MetS, asociada con los años de servicio y la edad.

Palabras clave: Policías; Hipertensión; Obesidad; Dislipidemia; Actividad policial.

1. Introduction

Metabolic syndrome (MetS) includes several abnormalities, such as abdominal obesity, peripheral insulin resistance, hyperlipidemia, and hypertension (Alberti et al., 2009; Zafar et al., 2018). It occurs mainly due to overnutrition and low physical activity, leading to obesity (Esquirol et al., 2009; Myers et al., 2019). MetS represents the leading risk factor for developing type 2 diabetes and cardiovascular diseases (Saklayen, 2018).

The number of MetS patients is high worldwide, with 34.2% of Americans (Moore et al.) and 31.2% of Brazilians aged 18 to 59 diagnosed with MetS (Oliveira et al., 2020). Interestingly, there are reports of MetS prevalence among members of law enforcement. For example, 24.5%. 25.7% and 38.5% of police officers exhibited MetS in Genoa, Italy (Garbarino & Magnavita, 2015), Buffalo, NY, USA (Baughman et al., 2016), and Bahia, Brazil (Filho & D'Oliveira Jr, 2014), respectively.

The city of São Paulo, Brazil, has around 12.3 million inhabitants (IBGE, 2020). Only Tokyo, Delhi, and ShanghaiIt have larger populations than Brazil. For admission into the Military Police of the State of São Paulo (PMESP), candidates must display high physical fitness and adequate physical and psychological health conditions (de Souza et al., 2018). However, the health conditions deteriorate with time, but the prevalence of MetS among military police officers (MPO) remains unaddressed. In the present study, we assessed the prevalence of MetS and its indicators individually in MPOs of São Paulo city. We also evaluated associations between MetS prevalence and the characteristics of radio patrol working, including shift duty and length in service. Furthermore, we determined the odds ratio of developing MetS based on alcohol consumption, smoking, physical activity practices, body mass index, and education level.

2. Material and Methods

2.1 Participants

MPOs from the Police Command 1 (CPA/M1) with operational activities in the radio patrol program of São Paulo city participated in this study. This study consisted of three phases: 1. Recruitment and screening of volunteers of the radio patrol program, based on information provided by the operation sectors (MPO who work for 8-12 hours, in uniform with ballistic vest and firearm, patrol the streets with a police vehicle); 2. Selection of the MPO according to inclusion criteria and 3. Classification and random choice of the participants in the groups.

We selected 560 MPOs; among them, 282 participants met the inclusion criteria for phase 1 (Figure 1). In phase 2, 196 met the inclusion criteria of working for ≤ 3 years in the PMESP, daytime (n= 57) or night time (n= 64); or working for ≥ 10 years, daytime (n= 43) or night time (n= 32). In phase 3, we randomly choose 26 MPO from each group, performing the study

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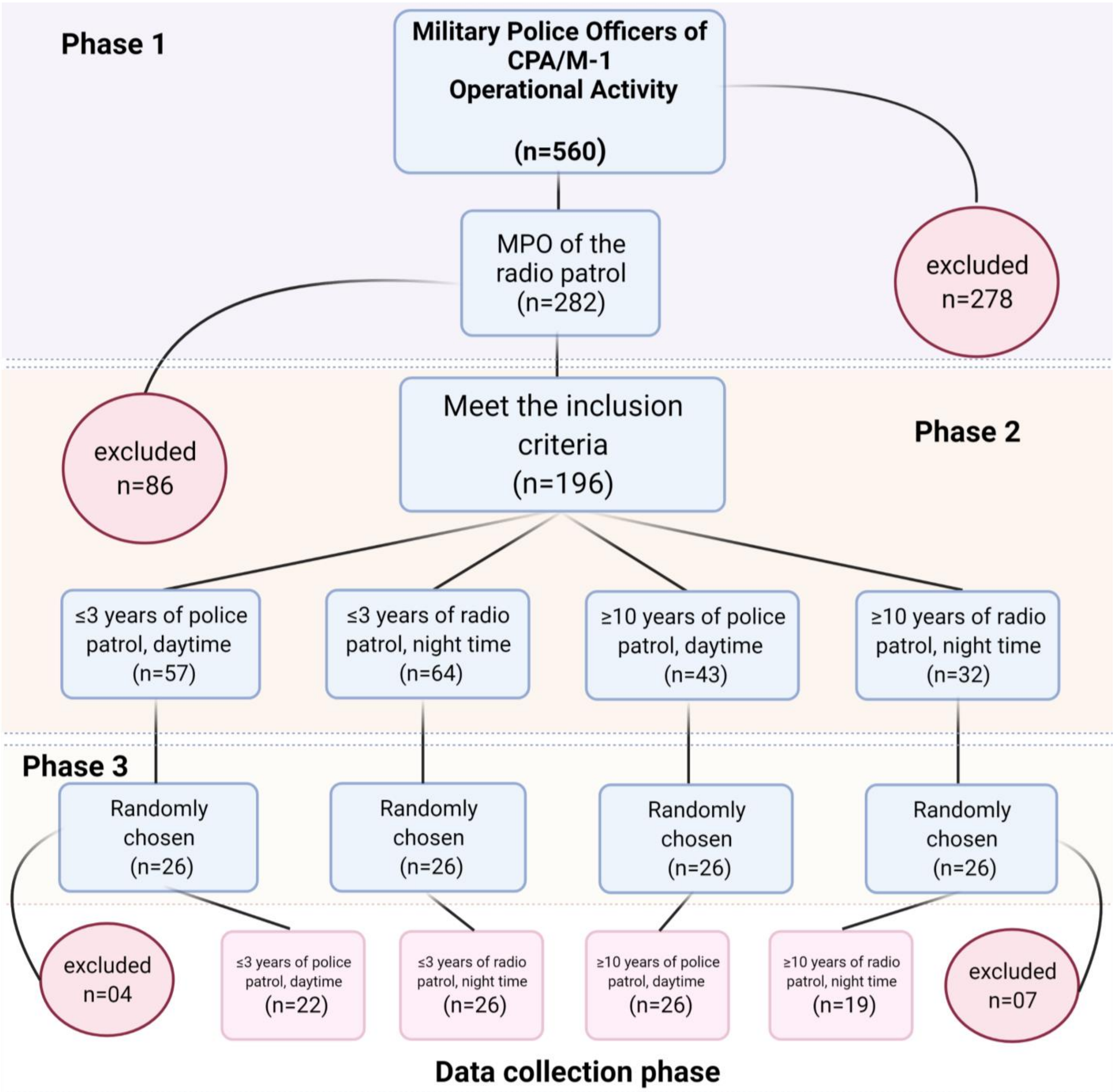
with 104 MPOs. Eleven volunteers were excluded from the study because they did not show up or follow the recommendations before data collection **(**Figure 1).

All volunteers signed an informed consent form. We carried out anthropometric measurements and blood samplings at the Physical Activity and Sports Sciences Institute (ICAFE), Cruzeiro do Sul University, São Paulo. The Ethics Committee of Cruzeiro do Sul University (Protocol number 3.272.747/19) approved the study under the Declaration of Helsinki.

Figure 1. Chart of the phases for the selection of the volunteers for each group. MPO: Military Police Officers; CPA / M-1: Metropolitan Area Policing Command 1. [São Paulo City, São Paulo State, Brazil. 2018]



Source: Authors (2021).

MPOs (n=93) were all male and had the following characteristics (mean ± SEM): age, 35.3 ± 8.33 years old; body mass, 86.55 ± 8.31 kg; height 174.0 ± 0.05 cm, and body mass index (BMI) 28.5 ± 4.26 kg/m². Of the 93 MPOs, 51.6% (48 volunteers) had less than three years working for the radio patrol program, and 48.4% (45 volunteers) had more than ten years. The volunteers working daytime (51.6%, n= 48) or nighttime (48.4%, n= 45) shifts were distributed equally. Additionally, 26.9% and 73% of the volunteers had university and high school degrees, respectively. We considered smokers only 7.5% of the volunteers, and 63.4% consumed more than 350 mL of alcohol per week. We found that 1.8% of the MPOs had a BMI of >25 kg/m². Volunteers who did not perform at least 150 minutes of physical activity per week accounted for 35.5% of the study sample (Table 1).

Table 1. We present the characteristics of the radio patrol program selected military police officers in the São Paulo city downtown (n= 93). We divided participants into each category with a 95% confidence interval (95% CI). [São Paulo City, São Paulo State, Brazil, 2018]

Characteristics	Number	Percentage (95% CI)
Service time in operational activity		
≤3years	48	51.6 (41.6 – 61.5)
≥10 years	45	48.4 (38.5 – 58.4)
Shift work		
Daytime	48	51.6 (41.6 – 61.5)
Nighttime	45	48.4 (38.5 – 58.4)
Education degree		
University Education Degree	25	26.9 (18.9 – 36.7)
High school	68	73.1 (63.3 – 81.1)
Smoking		
Yes	7	7.5 (3.7 – 14.7)
No	86	92.5 (85.3 – 96.3)
Alcohol consumption		
Yes	59	63.4 (53.3 – 72.5)
No	34	36.6 (27.5 – 46.7)
Body Mass Index		
< 25 (kg/m²)	17	18.2 (11.7 – 27.3)
≥ 25 (kg/m²)	76	81.7 (72.6 – 88.2)
Physical activity >150 minutes per week		
Yes	60	64.5 (54.4 – 73.5)
No	33	35.5 (26.5 – 45.6)

Source: Authors (2021).

2.2 Data collection

Initially, the participants completed a questionnaire to collect information about age and work shift for the PMESP. Using a vertical stadiometer (model 206 Bodymeter, SECA, Hamburg, Germany), we measured the participant height with 220 cm in length and 0.1 cm precision. We recorded body composition and body weight using a bioimpedance device (mBCA 515, SECA), body mass index (BMI), waist-to-hip ratio (WHR), and waist circumference (Fidanza et al., 1991). We measured systolic blood pressure (SBP) and diastolic blood pressure (DBP) using a mercury sphygmomanometer (Premium, Zhejiang, China), with the participant at rest for at least 5 min (Malachias et al., 2016). We also assessed fasting plasma levels of glucose (Cordova et al., 2009), triacylglycerol (Bucolo & David, 1973), and high-density lipoprotein (HDL) cholesterol (Jabbar et al., 2006). We determined the activities of the liver enzymes such as alanine aminotransferase (ALT), aspartate aminotransferase (AST), and gamma-glutamyl transpeptidase (GGT) using a commercially available kit following the manufacturer's instructions (ROCHE diagnostic, Risch-Rotkreuz Swiss) (Schumann, Bonora, Ceriotti, Ferard, Ferrero, & Franck, 2002; Schumann, Bonora, Ceriotti, Ferard, Ferrero, Franck, et al., 2002; Schumann, Bonora, Ceriotti, Férard, et al., 2002). According to previous studies, plasma concentrations of C-reactive protein (CRP) and glycated hemoglobin were determined (Karl, 1993; Roberts et al., 2001). We assessed the triacylglycerol versus glucose index using the following equation:

TyG = [Log (triacylglycerol (mg/dL) × glucose (mg/dL)] ÷ 2 (Vasques et al., 2011).

We measured all plasma measurements using the Diagnostic and Analysis Center (CDA) Laboratory (São Paulo, Brazil). Lastly, plasma cytokines [interleukin (IL)-1β, IL-6, IL-8, IL-10, IL-12p70, and tumor necrosis factor-alpha (TNF-α)] concentrations were determined using the Cytometric Bead Array (CBA), using Human CBA and flow cytometry (BD Accuri cytometer, Becton Dickinson, New Jersey, USA) according to the manufacturer's instructions (Morgan et al., 2004).

The participants answered a questionnaire on lifestyle behavior, including alcohol consumption, smoking, and physical activity. We considered smokers individuals who have smoked at least two cigarettes a day for more than three months. We defined alcohol users by the frequent weekly consumption of alcoholic beverages above 350 mL in the last year. Those who reported more than 150 min per week of walking and running as a form of leisure, or any other sport, continuously or intermittently, were defined as physically active. We defined the education level as those with a university or high school diploma. We assessed the items using a dichotomized response (Yes or No).

2.3 Metabolic syndrome diagnosis

We based the diagnosis of MetS on a previous study (Alberti et al., 2009) and the criteria proposed by the International Diabetes Federation (IDF). In this sense, patients presenting three of the following five indicators:

I. Waist circumference ≥90 cm in men
II. Systolic and diastolic blood pressure ≥130 or ≥85 mmHg or drug treatment for hypertension
III. Fasting plasma glucose concentration ≥100 mg/dL or drug treatment for hyperglycemia
IV. Serum triacylglycerol concentration ≥150 mg/dL
V. Plasma HDL levels <40 mg/dL or medication for the treatment of dyslipidemia were considered to have MetS

2.4 Statistical analysis

The results were analyzed using PRISM software, version 9.0 (Graph Pad, San Diego, CA, USA). Results were expressed as the mean ± SEM, and the significance level was 95% (p≤0.05). We adopted the D'Agostino & Pearson normality test to detect variables with parametric and non-parametric distributions. The comparison between daytime **vs.** nighttime and between ≤3 years **vs.** ≥ 10 years was performed using the Student's t-test for parametric data or Mann-Whitney for non-parametric data. The association between dichotomous variables was analyzed using the Chi-Square test. We used univariate binary logistic regression analysis to determine the odds ratio (OR) and the 95% confidence interval (95% CI) percentage**.** The sample size calculation used the prevalence of MetS reported by Filho et al. (2014), considering the total number of MPOs in São Paulo (approximately 10,000). We estimated that 88 volunteers would reach a 90% CI with 91.5% accuracy. The sample size calculation was performed using the Open-Source Epidemiological Statistics from Public Health (OPENEPI) platform, online version 3.01 (https://www.openepi.com/Menu/OE_Menu.htm), using the following formula: sample size (n) = [EDFF *

Np (1-p)] / [(d2 / Z21-α) / 2 * (N-1) + p * (1-p)] where N = population size [for the finite population correction factor (fpc)]; p = hypothetical % frequency of the outcome factor in the population; z = score; EDFF = design effect; and d= confidence limit as % of 100 (absolute +/- %) (Gontijo et al., 2020).

3. Results

3.1 Prevalence of metabolic syndrome (MetS) and frequency of the MetS specific indicators

The most frequent MetS indicators were high waist circumference (76.3%; CI 66.7–83.8%), elevated SBP or DBP or both (55.9%; CI 45.7–65.5%), low plasma HDL-c concentrations (44%; CI 34.4–54.2%), increased plasma triacylglycerol levels (32.2%; CI 23.6–42.3%), and elevated glycemia (20.4%; CI 13.4–29.7%) (Table 2).

The proportion of MPOs presenting three MetS indicators was 24.7% (CI 17–34.3%), those with four indicators was 16.1% (CI 10–24.9%), and 2.1% (CI 0.3–7.5%) presented five indicators. Thus, among the 93 study participants, the prevalence of MetS was 43.4% (CI 33.4–53.1%). Notably, 29.3% (CI 21–39.3%) of the participants displayed two indicators, suggesting that without the proper intervention, they may soon develop MetS (Table 2). The mean and individual values of the participants' biochemical, physiological and anthropometric parameters are presented in the supplemental data (Table S1A and B and Table S2A and B).

Table 2. Prevalence and frequency of metabolic syndrome indicators in the military police officers of the radio patrol program of São Paulo city (n= 93). The results are expressed as the frequency of the indicators, percentage, and 95% confidence interval (95% CI). [São Paulo City, São Paulo State, Brazil, 2018]

Prevalence of Indicator Metabolic Syndrome			
Indicators	**Number of cases**	**Percentage**	**(95% CI)**
WC >90 cm	71	76.3	(66.7–83.8)
SBP >135 or DBP >85 mm/Hg	52	55.9	(45.7–65.5)
HDL-c <40 mg/dL	41	44.0	(34.4–54.2)
TG >150 mg/dL	30	32.2	(23.6–42.3)
Glucose >100 mg/dL	19	20.4	(13.4–29.7)
Frequency of Metabolic Syndrome			
Number of indicators	**Number of cases**	**Percentage**	**(95% CI)**
0	6	6.4	(2.9–13.3)
1	20	21.7	(14.5–31.2)
2	27	29.3	(21.0–39.3)
3	23	25.0	(17.2–34.7)
4	15	16.3	(10.1–25.1)
5	2	2.1	(0.3–7.5)

WC: waist circumference; SBP: systolic blood pressure; DBP: diastolic blood pressure; HDL: high-density lipoprotein; TG: triacylglycerol.
Source: Authors (2021).

3.2 Odds ratios of the indicators and MetS

The univariate binary logistic regression analysis between each indicator and MetS (Table 3) indicated statistically significant ORs for developing MetS in MPOs with elevated plasma triacylglycerol concentrations (OR 16.0, 95% CI 5.58–

54.34, p<0.001), large waist circumferences (OR 11.52, 95% CI 3.05–75.56, p=0.001), low plasma HDL-c concentrations (OR 11.45, 95% CI 4.48–31.91, p <0.001), hypertension (OR 6.60, 95% CI 2.64–18.04, p <0.001), and hyperglycemia (OR 5.16, 95% CI 1.76–17.49, p=0.004).

There was no OR between MetS and the following conditions: length of service in the PMESP, work shift, education level, weekly alcohol consumption, or physical activity level. However, the OR for developing MetS was 2.5 times higher for those who were overweight or obese (BMI ≥25 kg/m²; OR 2.54, 95% CI 1.02–6.51, p= 0.04) (Table 3).

Table 3. Metabolic syndrome: predictors and working features associated with the Military Police Officers (n= 93). [São Paulo City, São Paulo State, Brazil, 2018]

Indicators of MetS	Prevalence of MetS Yes n (%)	No n (%)	OR	(95% CI)	p
Elevated triacylglycerol					
No	15 (23.8)	48 (76.2)	1	1	
Yes	25 (83.3)	5 (16.7)	16.0	(5.58–54.34)	<0.001***
High waist circumference					
No	2 (9.1)	20 (90.9)	1	1	
Yes	38 (53.5)	33 (46.5)	11.52	(3.05–75.56)	0.001**
Low HDL-c					
No	10 (35.1)	42 (64.9)	1	1	
Yes	30 (73.2)	11 (26.8)	11.45	(4.48–31.91)	<0.001***
Hypertension					
No	8 (19.5)	33 (80.5)	1	1	
Yes	32 (61.5)	20 (38.5)	6.60	(2.64–18.04)	<0.001***
Hyperglycemia					
No	26 (23.5)	48 (64.9)	1	1	
Yes	14 (73.7)	5 (26.3)	5.16	(1.76–17.49)	0.004**
Working characteristics	**Yes n (%)**	**No n (%)**	**OR**	**(95% CI)**	**P**
MPO experience					
≤3years	16 (33.3)	32 (66.7)	1	1	
≥10 years	21 (53.3)	24 (46.7)	2.28	(0.99–5.36)	0.05
Shift					
Daytime	20 (41.7)	28 (58.3)	1	1	
Nighttime	20 (44.4)	25 (55.6)	0.89	(0.39–2.03)	0.78
Education level					
Graduate degree	13 (52.0)	12 (48.0)	1	1	
High School diploma	27 (39.7)	41 (60.3)	1.64	(0.65–4.18)	0.29
Smoking					
No	2 (28.6)	5 (71.4)	1	1	
Yes	38 (44.2)	48 (55.8)	0.50	(0.06 - 2.48)	0.42
Alcohol consumption					
No	26 (44.1)	33 (55.9)	1	1	
Yes	14 (41.2)	20 (55.8)	1.12	(0.48–2.7)	0.78
Body Mass Index					
< 25(kg/m²)	4 (23.5)	13 (76.5)	1	1	
≥ 25(kg/m²)	36 (47.4)	40 (52.6)	2.54	(1.02–6.51)	0.04*
Weekly physical activity					
>150 min	23 (38.3)	37 (61.7)	1	1	
<150 min	17 (51.5)	16 (48.5)	1.70	(0.72–4.07)	0.22

The data were analyzed using univariate binary logistic regression to determine the odds ratio (OR), confidence interval (95% CI), and percentage. The level of significance was set at p<0.05*, p<0.01**, p<0.001***. HDL-c: high-density lipoprotein cholesterol. Source: Authors (2021).

The continuous cofactors, age (OR 1.06, 95% CI 1.01–1.12, p = 0.02) and length of service (OR 1.07, 95% CI 1.01–1.13, p = 0.01) were determined to be independent predictors of MetS. In this sense, the risk of developing MetS increased 6–7% each additional year of age or work (Table 4).

Table 4. Table of the continuous cofactors associated with MetS in Military Police Officers (n= 93)**.** The data were analyzed using logistic regression to determine the odds ratio (OR), confidence interval (95% CI), and percentage. [São Paulo City, São Paulo State, Brazil, 2018]

	Odds ratios		
Cofactors	**β0 (95% CI)**	**β1 (95% CI)**	**p (β1)**
	Estimate		
Years worked	0,38 (0.18-0.07)	1,07 (1.01-1.12)	0.010*
Years old	0.08 (0.01-0.54)	1.06 (1.01-1.13)	0.020*

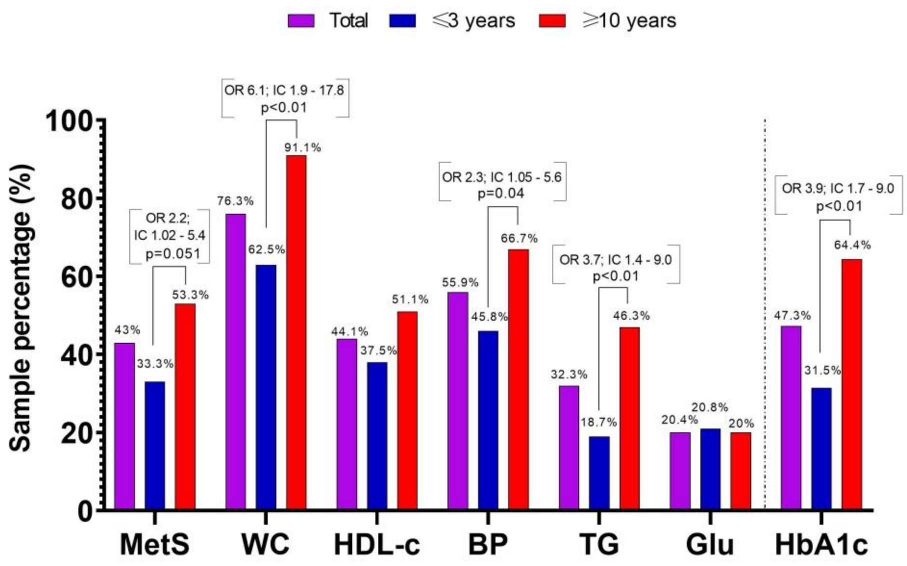
The level of significance was set at p <0.05. β0=intercept; β1=cofactors. Source: Authors (2021).

3.3 Association of working time with MetS indicators

The length of MPO service was associated with MetS (OR 2.28; CI 1.02–5.41; p=0.051), and with the high prevalence of the following indicators: waist circumference (OR 6.1; CI 1.9–17.8; p <0.01), hypertension (OR 2.3; CI 1.05–5.6; p<0.05), and hypertriglyceridemia (OR 3.7; CI 1.4 - 9.0; p <0.01). Additionally, there was a close association between service length and glycated hemoglobin (OR 3.9; CI 1.7–9.0; p<0.01) (Figure 2). In contrast, we do not associate HDL-c (OR 1.7; CI 0.79–3.97; p=0.21) and glycemia (OR 0.95; CI 0.35–2.42; p>0.99) with a length of service as an MPO.

We did not find associations between work shifts and MetS indicators. However, we must point out that the age variability between groups, 34.4 ± 8.8 years old for nighttime and 36.1 ±7.8 years old for daytime, probably influenced this finding.

Figure 2. Association of working time (≤ 3 years and ≥ 10 years) at PMESP with components of the metabolic syndrome of the military police officers (n=93). [São Paulo City, São Paulo State, Brazil, 2018]



MetS: metabolic syndrome; WC: high abdominal circumference; HDL-c: low high-density lipoprotein; BP: high systolic or diastolic blood pressure or both; TG: elevated triglyceride; GLU: high fasting blood glucose; HbA1C: high glycated hemoglobin. The data were analyzed using Chi-Square test, the odds ratio (OR) and 95% confidence interval (95% CI) percentage are presented. The level of significance was set at p <0.05. Source: Authors (2021).

4. Discussion

The present study found that the prevalence of MetS in male MPOs working in downtown São Paulo city is 43.3%. Recently, Oliveira et al. (2020) reported that 31.2% of Brazilian men and women between 18 and 59 years have MetS. Thus, the prevalence among MPOs is 12.1% higher than the general Brazilian civilian population (Oliveira et al., 2020).

The prevalence of MetS in the law enforcement population, including MPOs worldwide, changes significantly with diagnostic criteria, age, and occupation type (Chang et al., 2015; Hartley et al., 2011; Rostami et al., 2019; Tharkar et al., 2008; Thayyil et al., 2012; Violanti et al., 2009; Yoo et al., 2009). It ranges from 11% to 57% (Rostami et al., 2019). For example, 11%, 16-57%, 16–36%, 38,5%, and 24.5% of police officers were determined to have MetS in Iran (Payab, 2017), India (Tharkar et al., 2008; Thayyil et al., 2012), the USA (Hartley et al., 2011; Violanti et al., 2009; Yoo et al., 2009), Brazil (Filho & D'Oliveira Jr, 2014), and Taiwan (Chang et al., 2015), respectively.

Thus, our results are higher than the average (26%) found in police officers of the countries mentioned (Rostami et al., 2019). The more frequent MetS indicators were abdominal adiposity, arterial hypertension, and low plasma HDL levels. Similar results were reported in civilians by Oliveira et al. (2020) and MPOs of Pernambuco state by Da-Silva et al. (2019) (da-Silva et al., 2019). These results are consistent with previous studies that have demonstrated that increased waist circumference was the primary indicator of MetS, followed by hypertension or low plasma HDL levels (Oliveira et al., 2020; Tharkar et al., 2008). These three indicators were also reported as the most prevalent in a study carried out in Taiwan and the USA (Chang et al., 2015; Violanti et al., 2009).

The identified MetS indicators are due to lifestyle characteristics, such as low physical activity and high-calorie food consumption (Myers et al., 2019; Zafar et al., 2018). Herein, we found that 49% of the MPOs are sedentary or insufficiently active (data not shown), about twice as high as the civilian population in São Paulo. Porto et al. (2020) (unpublished data) observed that MPO's do not reach the minimum number of daily steps recommended by the health agencies during their working period, regardless of the shift (*i.e.,* daytime or nighttime). Consequently, these individuals expend fewer calories and are overweight or obese.

It is well-known that low-intensity chronic inflammation is associated with excess body weight, inducing metabolic changes such as peripheral insulin resistance, type 2 diabetes, and MetS. In the present study, we found that 81.8% of participants were overweight or obese. Additionally, MPOs with ≥10 years of service had higher absolute fat mass, visceral fat, BMI, and waist circumference than MPOs with ≤3 years **(described in the supplemental data)**.

Interestingly, a previous study showed that the obesity-associated activation of IKKβ leads to the translocation of the transcription factor NF-κB from the cytoplasm to the nucleus, increasing pro-inflammatory cytokines, including pro-IL-1β, IL-6, IL-8, and TNF-α (Bremer et al., 2011). Consistent with this observation, we detected elevated plasma levels of IL-6 and IL-8 in MPOs with ≥10 years of experience **(described in the supplemental data)**. Furthermore, the MPOs with ≥10 years of experience presented increased TNF-α, a pro-inflammatory mediator, concentrations, which can activate the JNK signaling pathway in peripheral tissues, promote IRS-1 serine residue phosphorylation and disrupt insulin/insulin receptor/IRS signaling, culminating in insulin resistance (Yaribeygi et al., 2019).

There was no significant association between the work shift and MetS prevalence. However, we observed a 53.3% prevalence of MetS in MPO with ≥10 years at the PMESP. These findings suggest that the job characteristics of police officers, including excessive work hours, restricted night sleep due to the shift work schedule, potential and unexpected stressor situations (Charles et al., 2016; de Souza et al., 2018; Esquirol et al., 2009; Violanti et al., 2017), and low physical activity during work (Porto et al., 2020 unpublished data) contribute to the development of MetS. It is also important to point out that aging *per se* also plays an essential role in MetS development because there is a high occurrence of chronic diseases in the aged population (Schmidt et al., 2011).

Indeed, studies have reported the accumulation of chemically modified molecules in tissues due to elevated reactive oxygen and nitrogen species production during aging (Ballinger, 2005; Sun et al., 2016). Moreover, increased oxidative damage, decreased oxidative phosphorylation activity, attenuated metabolic enzyme activity, and altered mitochondrial morphology have been associated with mitochondrial dysfunction (Sun et al., 2016). These alterations have been previously associated with age-related diseases, such as cardiovascular disorders, diabetes, obesity, and cancer (Ballinger, 2005; Wang et al., 2020). Merino et al. (2010) (unpublished data) reported that male MPOs over 44 years old from São Paulo state have a 2.5–4-fold higher risk of premature death from cardiovascular and liver diseases than the civilian population of the same sex and age. The same authors also found that MPO mortality from the exact causes is lower in MPOs less than 29 years of age. It is plausible that the aging effects are pronounced in law enforcement officers leading to marked metabolic changes and early MetS development compared to the civilian population.

Our results showed that MPOs with ≥10 years of experience are 1.6 times more MetS prevalence than ≤3 years. Among the indicators associated with length of service (≥10 years), we observed high waist circumference, hypertension, hypertriglyceridemia, high HbA1c, and MetS. The work shift was not associated with any MetS indicator. Additionally, being overweight or obese increases the chance of developing MetS by 2.2 times. The most critical predictor is the elevated triacylglycerol concentrations, which increases the likelihood of developing MetS 16 times. The IL-6 and IL-8 plasma levels were also higher in ≥10 years than in MPOs with ≤3 years **(described in the supplemental data)**. Previously, it was shown that IL-6 is a cytokine associated with an increased risk of myocardial ischemia in men (Ridker et al., 2000), and IL-8 has been associated with coronary artery disease due to its action in recruiting monocytes to endothelial tissue (Barcelos et al., 2019). Thus, our results suggest that MPOs are more susceptible to cardiovascular disease development.

In conclusion, our results indicate an urgent need for direct and/or indirect intervention programs to prevent and treat MetS in MPOs. Health promotion programs with dietary guidance, exercise, and stress reduction strategies might attenuate MetS prevalence and improve the quality of life of law enforcement officers globally.

5. Declarations

5.1 Ethics approval and consent to participate

The Ethics Committee of Cruzeiro do Sul University approved the study under the Declaration of Helsinki. All volunteers signed an informed consent form. Protocol number 3.272.747/19

5.2 Competing interests

The authors state that there is no conflict of interest in the conduct and results of the study.

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5.4 Authors' contributions

DRS designed the study, collected anthropometric and body composition data, applied questionnaire, tabulated data, assays of plasma cytokines, statistical analysis, interpreted the results, and drafted and revised the paper. He is guarantor. ACCM collected anthropometric and body composition data, applied questionnaire, collected blood for plasma analysis. ACLP designed the study, collected blood for plasma analysis, statistical analysis, interpreted the results, and drafted and revised the paper. ASAS applied questionnaire, collected blood for plasma analysis, tabulated data. BBD applied questionnaire, collected blood for plasma analysis. BFS applied questionnaire, collected blood for plasma analysis. CMM collected anthropometric and body composition data, applied questionnaire. DTA collected blood for plasma analysis, tabulated data, return of results to participants. EBS collected anthropometric and body composition data, collected blood for plasma analysis. EH designed the study. ENS collected anthropometric and body composition data, applied questionnaire, collected blood for plasma analysis, tabulated data. FGF collected anthropometric and body composition data, applied questionnaire, tabulated data. IC collected blood for plasma analysis. JRLJ designed the study. LB collected anthropometric and body composition data, applied questionnaire. LBO collected anthropometric and body composition data, applied questionnaire. LNM applied questionnaire, interpreted the results. LP collected anthropometric and body composition data, applied questionnaire, tabulated data. LSO Assays of plasma cytokines, collected blood for plasma analysis, tabulated data. MEPP collected blood for plasma analysis. MFCB designed the study, drafted and revised the paper. MMA collected blood for plasma analysis, applied questionnaire, MS applied questionnaire, collected blood for plasma analysis, tabulated data. NFP designed the study, tabulated data. PD collected anthropometric and body composition data, applied questionnaire, collected blood for plasma analysis, tabulated data. PBR collected anthropometric and body composition data, applied questionnaire, tabulated data. RBB drafted and revised the paper. RBG collected blood for plasma applied questionnaire. RC designed the study, statistical analysis, interpreted the results, drafted and revised the paper. RFZ applied questionnaire, collected blood for plasma analysis, tabulated data. RG designed the study, collected blood for plasma analysis, assays of plasma cytokines, interpreted the results, drafted and revised the paper. RM collected anthropometric and body composition data, applied questionnaire. SMH designed the study, statistical analysis, interpreted the results, drafted and revised the paper. SOP applied questionnaire, collected blood for plasma analysis. TBL collected blood for plasma analysis. TCPC designed the study, interpreted the results, drafted and revised the paper. TSS applied questionnaire, collected blood for plasma analysis. VLS applied questionnaire, collected blood for plasma analysis, tabulated data. All authors read and approved the final manuscript.

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Supplemental data

S1-A. Supplemental data

Sample						Metabolic syndrome components						Plasma Parameters					
Number	Volunteers	Group	Period	ages (years)	years worked	Systolic (mmHg)	Diastolic (mmHg)	blood glucose (mg/dl)	triglycerides (mg/dl)	HDL Cholesterol (mg/dl)	abdominal circumference (cm)	HbA1C %	TyG index	AST (U/L)	ALT (U/L)	GGT (U/L)	c-reactive protein (mg/dl)
1	ERG	≥ 10 years	Daytime	34	10	129	77	86	468	41	95	5,71	4,30	24	20	22	0,07
2	TPL	≤ 3 years	Daytime	31	2	140	80	78	52	37	88	5,82	3,31	94	71	15	0,39
3	CCS	≤ 3 years	Daytime	27	3	116	70	88	108	42	92	5,79	3,68	26	16	23	0,03
4	DDS	≥ 10 years	Daytime	43	24	133	87	89	82	98	108	6,91	3,56	24	28	156	0,24
5	RLBP	≥ 10 years	Daytime	43	22	143	83	99	229	34	111	6,01	4,05	35	70	58	0,27
6	VMU	≥ 10 years	Daytime	40	18	129	85	82	76	42	78	5,57	3,49	22	13	13	0,86
7	JWOS	≤ 3 years	Daytime	29	3	138	83	99	62	62	79	5,6	3,49	20	20	45	0,05
8	LLA	≥ 10 years	Daytime	29	10	117	60	88	64	33	93	5,37	3,45	21	13	9	0,03
9	JZGL	≥ 10 years	Daytime	43	22	150	80	95	149	31	105	5,22	3,85	22	37	38	0,08
10	AMG	≥ 10 years	Daytime	42	12	140	80	91	71	62	99	5,36	3,51	19	19	24	0,04
11	ASO	≥ 10 years	Daytime	37	12	124	74	100	78	56	102	5,92	3,59	18	18	13	0,17
12	CMR	≤ 3 years	Night time	29	3	110	60	90	68	46	95	5,27	3,49	31	14	22	0,05
13	ASP	≥ 10 years	Night time	45	18	120	70	97	132	39	118	5,98	3,81	22	20	27	1,14
14	PHG	≤ 3 years	Night time	29	3	127	69	86	94	41	95	5,65	3,61	34	20	18	0,13
15	FAP	≥ 10 years	Night time	38	15	139	88	92	270	29	102	5,71	4,09	48	35	40	2,71
16	ACJM	≥ 10 years	Night time	47	15	140	80	87	179	25	117	6,09	3,89	17	20	37	0,46
17	ESD	≤ 3 years	Night time	30	3	126	70	88	109	28	96	5,31	3,68	37	32	26	0,77
18	DHOR	≤ 3 years	Night time	26	2	140	70	91	78	42	92	5,37	3,55	17	8	31	0,01
19	RPS	≥ 10 years	Daytime	42	21	169	99	89	201	34	133	5,85	3,95	27	23	21	0,20
20	LPJ	≥ 10 years	Daytime	43	21	145	95	97	88	45	122	5,64	3,63	29	66	32	0,24
21	JCSS	≥ 10 years	Daytime	43	21	160	90	103	188	49	126	5,7	3,99	27	37	75	0,30
22	MRSO	≥ 10 years	Daytime	45	21	140	80	98	74	75	104	5,9	3,56	62	59	40	0,28
23	CHRC	≤ 3 years	Daytime	24	3	151	95	97	126	35	103	5,51	3,79	24	26	20	0,69
24	HS	≤ 3 years	Daytime	35	3	128	71	86	198	33	97	5,62	3,93	20	27	30	0,18
25	MVS	≤ 3 years	Daytime	28	2	127	68	76	223	39	79	5,6	3,93	16	24	38	0,30
26	OSS	≥ 10 years	Daytime	47	18	172	82	100	101	35	99	5,94	3,70	22	14	17	0,46
27	FME	≥ 10 years	Daytime	42	21	119	72	93	190	46	102	5,9	3,95	24	33	23	0,12
28	FGT	≤ 3 years	Daytime	31	1	130	77	104	145	52	92	6,02	3,88	46	66	32	0,30
29	FBAJ	≤ 3 years	Daytime	32	3	129	91	86	194	31	101	5,68	3,92	47	65	158	0,82
30	AJF	≤ 3 years	Daytime	30	2	130	70	96	138	44	81	5,31	3,82	18	12	13	0,01
31	JEFS	≥ 10 years	Night time	47	24	130	90	94	328	35	98	5,94	4,19	32	39	55	0,11
32	CRAA	≥ 10 years	Night time	51	22	130	80	117	192	38	100	6,8	4,05	29	47	94	0,33
33	GAAS	≤ 3 years	Daytime	33	2	130	90	87	64	34	103	5,87	3,44	40	82	43	0,30
34	FTG	≤ 3 years	Night time	25	3	120	70	86	145	33.8	85	5,53	3,79	21	23	15	0,01
35	JMM	≥ 10 years	Night time	49	20	150	110	102	193	32	95	6,16	3,99	25	47	38	0,03
36	PVRS	≤ 3 years	Night time	27	3	130	70	102	140	50	94	5,62	3,85	60	30	100	0,04
37	ALMS	≤ 3 years	Night time	28	3	130	90	101	94	46	113	6,12	3,68	18	25	20	0,36
38	MRS	≤ 3 years	Night time	35	3	110	80	83	73	53	89	5,39	3,48	20	23	29	0,20
39	ASZC	≤ 3 years	Night time	22	2	110	80	95	164	37	97	5,03	3,89	14	12	11	0,04
40	GRA	≤ 3 years	Night time	32	2	110	80	101	96	49	99	5,81	3,69	25	42	32	0,06
41	CMO	≤ 3 years	Daytime	31	3	110	59	95	119	48	97	5,75	3,75	43	81	76	0,49
42	PRL	≥ 10 years	Daytime	43	22	140	88	96	197	38	87	5,95	3,98	33	23	20	0,18
43	JEMM	≥ 10 years	Daytime	39	12	134	81	91	115	34	96	5,42	3,72	29	50	24	0,19
44	FRI	≤ 3 years	Night time	33	2	142	87	75	88	51	88	5,43	3,52	27	23	23	0,32
45	JRSS	≥ 10 years	Daytime	48	23	139	88	103	155	41	115	5,05	3,90	36	42	68	0,15
46	MVB	≤ 3 years	Daytime	30	2	130	67	76	59	40	85	5,5	3,35	23	17	29	0,13

Supplementary data of the individual values of all variables analyzed. Values indicated with a red circle are outside the normal range. Values indicated with a green circle are inside the normal range.

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S1-B. Supplemental data (continuation of table S1-A)

Sample						Metabolic syndrome components						Plasma Parameters					
Number	Volunteers	Group	Period	ages (years)	years worked	Systolic (mmHg)	Diastolic (mmHg)	blood glucose (mg/dl)	triglycerides (mg/dl)	HDL Cholesterol (mg/dl)	abdominal circumference (cm)	HbA1C %	TyG index (mg/dL)	AST (U/L)	ALT (U/L)	GGT (U/L)	c-reactive protein (mg/dl)
47	MCJ	≥ 10 years	Daytime	51	22	🔴 163	🔴 86	🔴 132	🔴 210	🟢 40	🔴 95	🟢 5,69	4,1	🟢 20	🟢 22	🟢 21	🟢 0,22
48	ASA	≤ 3 years	Daytime	27	2	🟢 126	🟢 72	🟢 84	🟢 127	🟢 46	🟢 86	🟢 5,58	3,7	🟢 30	🔴 64	🔴 62	🟢 0,09
49	DBDS	≤ 3 years	Daytime	32	2	🟢 128	🟢 66	🔴 107	🟢 129	🟢 42	🔴 95	🟢 5,66	3,8	🟢 22	🟢 31	🔴 77	🟢 0,19
50	SNAF	≥ 10 years	Daytime	39	12	🟢 122	🟢 73	🟢 93	🟢 103	🟢 52	🟢 87	🔴 5,8	3,7	🟢 20	🟢 17	🟢 13	🟢 0,53
51	GMS	≤ 3 years	Night time	22	2	🟢 110	🟢 60	🟢 82	🟢 80	🔴 38	🟢 86	🟢 5,57	3,5	🟢 16	🟢 16	🟢 22	🟢 0,08
52	OWN	≤ 3 years	Night time	23	3	🟢 110	🟢 60	🟢 88	🟢 146	🟢 45	🟢 81	🔴 5,73	3,8	🟢 14	🟢 8	🟢 9	🟢 0,02
53	LCS	≥ 10 years	Night time	47	22	🟢 120	🔴 90	🟢 89	🔴 265	🔴 39	🔴 109	🔴 6,09	4,1	🟢 21	🟢 29	🔴 59	🟢 0,14
54	APS	≥ 10 years	Night time	41	21	🟢 110	🟢 70	🟢 84	🔴 189	🔴 38	🔴 109	🔴 5,83	3,9	🟢 16	🟢 21	🔴 45	🟢 0,27
55	AJMJ	≤ 3 years	Night time	30	2	🔴 130	🟢 80	🟢 87	🟢 129	🔴 36	🔴 119	🟢 5,6	3,7	🟢 24	🟢 35	🟢 20	🟢 0,17
56	DFS	≤ 3 years	Night time	27	3	🟢 110	🟢 80	🟢 90	🟢 143	🟢 46	🔴 101	🟢 5,4	3,8	🟢 28	🟢 42	🔴 50	🟢 0,05
57	BSF	≤ 3 years	Night time	29	2	🔴 140	🟢 80	🟢 93	🟢 119	🟢 46	🔴 110	🟢 5,67	3,7	🔴 37	🟢 58	🔴 51	🔴 1,05
58	AVS	≥ 10 years	Night time	39	17	🟢 120	🔴 90	🟢 89	🔴 265	🔴 37	🔴 107	🔴 6,15	4,1	🟢 25	🟢 32	🔴 67	🟢 0,89
59	WS	≥ 10 years	Night time	41	13	🔴 140	🟢 70	🟢 99	🟢 106	🟢 41	🔴 110	🟢 5,66	3,7	🟢 27	🟢 39	🔴 42	🟢 0,30
60	NJM	≤ 3 years	Daytime	28	3	🟢 117	🟢 71	🟢 95	🟢 103	🔴 37	🟢 80	🟢 5,68	3,7	🟢 31	🟢 42	🟢 32	🟢 0,72
61	AG	≥ 10 years	Night time	39	12	🟢 113	🟢 73	🟢 94	🟢 137	🔴 35	🔴 107	🔴 6	3,8	🟢 15	🟢 18	🟢 29	🟢 0,66
62	SFS	≥ 10 years	Night time	46	17	🔴 140	🔴 100	🟢 91	🟢 107	🟢 52	🔴 92	🔴 5,93	3,7	🟢 17	🟢 15	🟢 17	🟢 0,14
63	RG	≥ 10 years	Night time	47	21	🟢 128	🟢 78	🟢 98	🔴 183	🟢 44	🔴 93	🔴 5,81	4,0	🟢 25	🟢 28	🟢 38	🟢 0,03
64	OAA	≥ 10 years	Night time	47	21	🔴 138	🟢 78	🟢 85	🟢 70	🔴 37	🔴 94	🔴 5,88	3,5	🟢 28	🟢 31	🟢 22	🟢 0,04
65	MOC	≤ 3 years	Night time	34	3	🔴 135	🟢 73	🟢 79	🟢 66	🟢 59	🟢 76	🟢 5,01	3,4	🟢 17	🟢 31	🔴 106	🟢 0,04
66	DKN	≤ 3 years	Night time	28	3	🟢 110	🟢 60	🟢 79	🟢 87	🟢 51	🟢 82	🟢 5,49	3,5	🟢 17	🟢 15	🟢 14	🟢 0,06
67	ARP	≥ 10 years	Daytime	38	15	🟢 124	🔴 85	🟢 77	🟢 77	🔴 33	🔴 92	🟢 5,57	3,5	🔴 44	🔴 66	🟢 34	🟢 0,08
68	DVS	≥ 10 years	Daytime	37	15	🔴 148	🟢 82	🔴 105	🔴 184	🟢 47	🔴 115	🔴 5,7	4,0	🟢 25	🟢 40	🟢 30	🟢 0,31
69	GSS	≤ 3 years	Daytime	26	3	🔴 170	🟢 71	🟢 88	🟢 78	🔴 37	🔴 96	🔴 5,94	3,5	🟢 32	🟢 45	🔴 51	🟢 0,32
70	REM	≤ 3 years	Daytime	30	3	🔴 138	🟢 72	🟢 92	🟢 67	🟢 45	🔴 98	🟢 5,25	3,5	🟢 31	🟢 19	🟢 18	🟢 0,20
71	ISSJ	≤ 3 years	Daytime	27	3	🔴 138	🟢 79	🟢 98	🟢 73	🟢 42	🔴 96	🟢 5,68	3,6	🟢 20	🟢 16	🟢 22	🟢 0,16
72	TRP	≤ 3 years	Daytime	27	3	🟢 110	🟢 60	🟢 74	🟢 68	🟢 47	🔴 101	🔴 6,09	3,4	🔴 49	🟢 31	🟢 21	🟢 0,18
73	GBG	≤ 3 years	Daytime	24	3	🔴 167	🟢 82	🔴 111	🟢 101	🟢 62	🔴 97	🟢 5,56	3,7	🟢 28	🔴 76	🟢 39	🟢 0,03
74	GRS	≥ 10 years	Daytime	47	17	🟢 129	🟢 79	🟢 84	🟢 107	🔴 34	🔴 96	🔴 5,86	3,7	🟢 24	🟢 29	🟢 16	🟢 0,04
75	RO	≤ 3 years	Daytime	27	3	🔴 136	🔴 86	🟢 87	🟢 72	🟢 54	🟢 83	🔴 5,73	3,5	🟢 25	🟢 14	🟢 20	🟢 0,06
76	MAL	≥ 10 years	Daytime	44	12	🟢 112	🟢 68	🟢 91	🟢 69	🟢 47	🔴 93	🟢 5,36	3,5	🟢 18	🟢 12	🟢 22	🟢 0,18
77	WSD	≥ 10 years	Daytime	43	15	🔴 140	🔴 90	🟢 96	🔴 155	🔴 29	🔴 109	🔴 6,13	3,9	🔴 73	🔴 138	🟢 35	🟢 0,16
78	ASC	≥ 10 years	Daytime	49	24	🔴 176	🔴 113	🔴 100	🟢 125	🟢 47	🔴 95	🔴 6,17	3,8	🟢 19	🟢 28	🔴 45	🟢 0,26
79	GAP	≥ 10 years	Daytime	48	17	🔴 137	🟢 84	🟢 89	🟢 104	🟢 41	🔴 95	🟢 5,68	3,7	🟢 16	🟢 20	🟢 32	🟢 0,07
80	JCR	≤ 3 years	Night time	33	3	🔴 137	🟢 83	🟢 75	🟢 92	🔴 33	🔴 100	🟢 5,69	3,5	🟢 26	🟢 47	🔴 54	🟢 0,19
81	LAC	≥ 10 years	Night time	50	18	🟢 116	🟢 73	🟢 75	🔴 341	🔴 33	🔴 103	🟢 5,53	4,1	🟢 24	🟢 26	🟢 16	🟢 0,12
82	DPS	≥ 10 years	Night time	43	23	🔴 140	🔴 100	🟢 95	🟢 133	🟢 40	🔴 131	🔴 6,01	3,8	🟢 23	🟢 25	🟢 27	🟢 0,27
83	DVO	≥ 10 years	Night time	36	12	🟢 120	🟢 80	🟢 85	🔴 180	🔴 32	🔴 100	🔴 5,74	3,9	🟢 22	🟢 18	🟢 22	🟢 0,26
84	LFG	≤ 3 years	Night time	24	1	🟢 116	🟢 73	🟢 97	🔴 355	🔴 31	🔴 92	🟢 5,53	4,2	🟢 16	🟢 11	🟢 13	🟢 0,05
85	TSR	≤ 3 years	Daytime	28	1	🟢 120	🟢 60	🔴 111	🟢 69	🔴 30	🟢 83	🔴 5,72	3,6	🟢 25	🟢 18	🟢 18	🟢 0,27
86	RRFR	≤ 3 years	Night time	25	3	🟢 110	🟢 60	🟢 83	🟢 76	🟢 44	🔴 103	🔴 5,75	3,5	🟢 28	🟢 45	🔴 54	🟢 0,19
87	AJLR	≥ 10 years	Night time	38	15	🟢 100	🟢 60	🟢 86	🟢 95	🟢 41	🔴 95	🟢 5,18	3,6	🟢 27	🟢 23	🟢 19	🟢 0,41
88	HMR	≤ 3 years	Night time	29	3	🟢 120	🟢 80	🟢 82	🟢 65	🟢 41	🔴 94	🟢 5,56	3,4	🟢 18	🟢 17	🟢 14	🟢 0,29
89	LABS	≤ 3 years	Night time	26	2	🟢 125	🟢 63	🔴 104	🔴 177	🟢 49	🟢 90	🟢 5,57	4,0	🟢 14	🟢 13	🟢 23	🟢 0,26
90	MAA	≤ 3 years	Night time	24	1	🔴 134	🟢 73	🔴 121	🔴 168	🟢 51	🟢 86	🟢 5,1	4,0	🟢 14	🟢 13	🟢 10	🟢 0,22
91	LHF	≤ 3 years	Night time	23	1	🟢 120	🟢 80	🔴 125	🔴 157	🔴 34	🔴 102	🔴 5,89	4,0	🟢 18	🟢 17	🟢 19	🟢 0,04
92	DSO	≥ 10 years	Night time	34	13	🟢 110	🟢 60	🟢 97	🟢 58	🟢 62	🟢 81	🔴 5,99	3,4	🟢 19	🟢 14	🟢 12	🟢 0,05
93	RHC	≤ 3 years	Night time	33	3	🟢 110	🟢 70	🟢 87	🔴 353	🔴 38	🔴 111	🔴 6,21	4,2	🟢 20	🟢 32	🔴 59	🟢 0,39
Mean				35,3	9,87	130,30	77,87	92,56	137,80	42,48	97,75	5.71	3,75	27,05	32,03	35,85	0,27
Std. Deviation				8,3	8,22	15,93	11,31	10,68	77,06	10,67	11,70	0.32	0,23	12,85	21,06	27,28	0,35
Std. Error of Mean				0,9	0,85	1,65	1,17	1,11	7,99	1,11	1,21	0.03	0,02	1,33	2,18	2,83	0,04
Lower 95% CI of mean				33,6	8,17	127,00	75,54	90,36	122,00	40,28	95,34	5.64	3,70	24,41	27,70	30,23	0,20
Upper 95% CI of mean				37,1	11,57	133,60	80,20	94,76	153,70	44,68	100,20	5.77	3,80	29,70	36,37	41,47	0,34
Minimum				22,0	1,0	100,00	59,00	74,00	52,00	25,00	75,50	5,01	3,30	14,00	8,00	9,00	0,01
25% Percentile				28,0	3,0	119,50	70,00	86,00	78,00	35,00	91,65	5,53	3,50	19,00	17,50	19,50	0,06
Median				34,0	3,0	130,00	80,00	91,00	119,00	41,00	96,20	5,69	3,70	24,00	26,00	27,00	0,19
75% Percentile				43,0	18,0	140,00	85,00	98,00	179,50	47,00	103,10	5,91	3,90	29,50	41,00	44,00	0,30
Maximum				51,0	24,0	176,00	113,00	132,00	468,00	98,00	133,10	6,91	4,30	94,00	138,00	158,00	2,71
Range				29,0	23,0	76,00	54,00	58,00	416,00	73,00	57,60	1,90	1,00	80,00	130,00	149,00	2,70

Supplementary data of the individual values of all variables analyzed. Values indicated with a red circle are outside the normal range. Values indicated with a green circle are inside the normal range.

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S2-A. Supplemental data

		Inflammatory cytokines						Anthropometric and body composition parameters							Lifestyle			
Number	Volunteers	IL12p70	TNFα	IL-10	IL-6	IL-1β	IL-8	weight (kg)	height (m)		BMI (kg/m²)	skeletal muscle mass (Kg)	absolute fat mass (Kg)	visceral adipose tissue (L)	alcohol consumption	smoking	Education stage	practice of physical activity perceived >150 min/week
1	ERG	2.15	0.15	1.05	1.06	0.26	4.12	84.25	1.79	🔴	26,29	31.48	63.58	2.73	no	no	High School diploma	yes
2	TPL	1.58	0.02	0.58	0.5	0.12	2.83	91.85	1.84	🔴	27,13	37.45	74.1	2	no	no	High School diploma	yes
3	CCS	0.77	0.22	0.035	0.87	0.12	3.38	90.55	1.84	🔴	26,75	35.32	70.75	2.82	yes	no	High School diploma	yes
4	DDS	1.21	0.02	0.23	2.18	0.12	8.52	85.4	1.65	🔴	31,37	28.08	57.58	3.06	yes	no	Graduate degree	no
5	RLBP	1.06	0.02	0.41	1.88	0.12	6.99	98.8	1.78	🔴	31,18	28.47	57.59	3.38	yes	no	High School diploma	no
6	VMU	0.54	0.02	0.55	2.12	0.12	4.07	61.8	1.69	🟢	21,64	25.48	53.16	1.79	yes	no	High School diploma	yes
7	JWOS	0.083	2.37	0.59	8.36	0.78	4.27	78.5	1.77	🔴	25,06	30.98	62.54	1.98	yes	no	High School diploma	no
8	LLA	0.45	0.02	0.035	0.56	0.12	6.32	88.35	1.8	🔴	27,27	34.77	69.48	2.54	yes	no	Graduate degree	yes
9	JZGL	0.8	0.02	0.035	0.6	0.12	3.45	90.95	1.79	🔴	28,39	30.5	60.73	3.27	yes	no	Graduate degree	yes
10	AMG	0.51	0.02	0.34	1.03	0.12	4.34	92.55	1.73	🔴	30,92	33.4	66.38	3.27	yes	no	High School diploma	no
11	ASO	1.29	0.22	0.18	0.9	0.12	2.15	98.55	1.71	🔴	33,7	33.96	68.15	2.82	yes	no	High School diploma	yes
12	CMR	0.083	0.07	0.45	0.53	0.12	2.9	94.25	1.85	🔴	27,54	33.07	67.64	2.95	no	yes	High School diploma	no
13	ASP	0.083	0.02	0.035	2.75	0.12	5.33	102.15	1.68	🔴	36,19	30.16	61.94	3.07	yes	no	Graduate degree	no
14	PHG	0.51	0.22	0.035	0.97	0.12	3.26	96,00	1.87	🔴	27,45	37.5	73.21	3.73	no	no	High School diploma	yes
15	FAP	0.42	0.02	0.28	8.31	0.12	3.09	93.7	1.74	🔴	31,13	33.27	65.62	3.85	yes	no	Graduate degree	no
16	ACJM	0.083	0.02	0.23	2.69	0.12	4.37	104.2	1.69	🔴	36,48	35.32	70.98	2.31	yes	no	High School diploma	no
17	ESD	0.63	0.02	0.035	1.14	0.12	4.49	87.1	1.77	🔴	27,8	30.45	61.62	3.05	no	yes	High School diploma	no
18	DHOR	0.69	2.58	0.1	0.08	0.12	5.56	83.05	1.77	🔴	26,51	31.17	64.17	3.05	yes	yes	High School diploma	yes
19	RPS	0.54	0.02	0.07	0.69	0.12	7.04	122.05	1.74	🔴	40,31	37.95	77	10.03	yes	no	Graduate degree	yes
20	LPJ	0.42	0.02	0.035	2.38	0.12	5.56	105.25	1.71	🔴	35,99	29.7	61.41	7.75	no	no	High School diploma	yes
21	JCSS	0.72	0.02	0.27	1.24	0.12	2.02	127.35	1.79	🔴	39,75	35.84	71.29	9.78	yes	no	High School diploma	no
22	MRSO	0.99	0.02	0.41	0.43	0.12	4.97	99,00	1.7	🔴	34,26	33.71	67.68	4.37	no	no	High School diploma	yes
23	CHRC	1.58	0.04	0.41	0.97	0.12	1.68	86.1	1.66	🔴	31,25	28.31	57.18	4.34	no	no	High School diploma	yes
24	HS	1.21	0.02	0.13	0.24	0.12	1.12	86.3	1.75	🔴	28,18	28.62	58.66	3.85	yes	no	Graduate degree	no
25	MVS	0.083	0.04	0.15	0.31	0.12	3.38	66.5	1.75	🟢	21,71	27.21	56.8	1.56	no	no	Graduate degree	yes
26	OSS	0.54	0.02	0.035	2.01	0.12	1.92	84.7	1.67	🔴	30,37	29.97	61.85	3.71	yes	no	High School diploma	yes
27	FME	0.34	0.02	0.28	0.85	0.12	8.52	79.8	1.72	🔴	26,97	27.98	58.62	4.46	yes	no	High School diploma	no
28	FGT	1.06	0.46	0.035	0.92	0.12	4.12	73.3	1.66	🔴	26,6	27.61	57.18	2.69	no	no	High School diploma	yes
29	FBAJ	1.09	0.27	1.42	0.81	0.12	4.52	89.9	1.76	🔴	29,02	30.59	62.4	4.53	yes	no	High School diploma	no
30	AJF	0.69	0.42	0.15	0.08	0.12	2.78	81.5	1.89	🔴	28,77	31.14	63.31	3.39	no	no	Graduate degree	yes
31	JEFS	0.45	0.02	0.035	0.87	0.12	4.12	83.15	1.7	🔴	29,48	29.91	61.5	3.67	yes	no	High School diploma	yes
32	CRAA	1.31	0.02	0.13	0.9	0.12	4.9	84.2	1.69	🔴	29,84	25.45	53.25	4.07	yes	no	Graduate degree	no
33	GAAS	0.6	0.02	0.32	0.79	0.12	3.19	81.25	1.65	🟢	23,49	32.33	65.07	2.25	yes	no	High School diploma	no
34	FTG	0.51	0.02	0.035	0.79	0.12	2.08	82.15	1.87	🟢	24,83	30.44	63.29	2.86	no	no	High School diploma	yes
35	JMM	0.93	0.52	0.23	1.03	0.12	4.37	83.15	1.83	🔴	35,09	29.25	59.64	4.68	yes	no	High School diploma	no
36	PVRS	0.34	0.02	0.035	0.73	0.12	12.24	82.55	1.71	🔴	28,23	29.98	62.2	2.51	yes	yes	High School diploma	yes
37	ALMS	0.083	0.02	0.035	0.94	0.12	1.92	97.85	1.67	🟢	21,88	24	49.82	2.26	no	no	High School diploma	yes
38	MRS	0.34	0.02	0.15	0.72	0.12	3.16	60.3	1.66	🔴	27,02	32.02	65.34	1.66	yes	no	High School diploma	yes
39	ASZC	1.89	0.02	0.035	1.14	0.12	2.76	78.75	1.69	🔴	27,57	28.27	57.5	2.93	no	no	High School diploma	no
40	GRA	0.083	0.02	0.035	0.87	0.12	1.59	86.8	1.76	🔴	28,02	30.87	62.72	3.1	yes	no	High School diploma	yes
41	CMO	0.72	0.02	0.035	1	0.12	1.92	80.8	1.72	🔴	27,31	29.35	60.69	3.85	yes	yes	High School diploma	no
42	PRL	0.77	0.02	0.035	0.59	0.12	2.9	75.2	1.69	🔴	26,33	27.53	57.19	2.77	yes	no	Graduate degree	yes
43	JEMM	1.06	0.02	0.035	0.27	0.12	1.54	82.75	1.76	🔴	26,71	29.24	60.07	4.1	no	no	High School diploma	yes
44	FRI	0.51	0.48	0.15	0.16	0.12	2.27	75,00	1.69	🔴	26,26	28.44	57.08	2.82	yes	no	High School diploma	yes
45	JRSS	0.083	0.02	0.46	0.63	0.12	3.04	104.75	1.76	🔴	33,82	33.49	68.02	6.86	yes	no	High School diploma	no
46	MVB	1.16	0.12	0.38	0.08	0.12	0.49	73.3	1.7	🔴	25,36	28.99	60.22	2.69	yes	no	Graduate degree	yes

Supplementary data of the individual values of all variables analyzed. Values indicated with a red circle are outside the normal range. Values indicated with a green circle are inside the normal range.

S2-B. Supplemental data (continuation of table S2-A)

		Inflammatory cytokines						Anthropometric and body composition parameters						Lifestyle			
Number	Volunteers	IL12p70	TNFα	IL-10	IL-6	IL-1β	IL-8	weight (kg)	height (m)	BMI (kg/m²)	skeletal muscle mass (Kg)	absolute fat mass (Kg)	visceral adipose tissue (L)	alcohol consumption	smoking	Education stage	practice of physical activity perceived >150 min/week
47	MCJ	1.38	1.02	0.32	0.66	0.12	2.22	85.2	1.74	🔴 28,14	32.58	68.22	3.48	yes	no	High School diploma	no
48	ASA	1.21	0.02	1.04	1	0.12	2.48	73.25	1.76	🟢 23,65	29.22	59.51	2.66	no	no	Graduate degree	yes
49	DBDS	0.083	0.02	0.13	0.81	0.12	0.99	80.65	1.69	🔴 28,24	27.58	58.23	3.64	yes	no	High School diploma	yes
50	SNAF	0.72	0.02	1.59	1.14	0.12	1.68	79.25	1.75	🔴 25,88	29.11	60.69	2.87	yes	no	High School diploma	no
51	GMS	0.083	0.02	0.035	0.49	0.12	0.76	71.8	1.75	🟢 23,44	28.24	57.88	1.54	yes	no	High School diploma	yes
52	OWN	0.083	0.02	0.1	0.08	0.12	0.87	67.4	1.85	🟢 19,69	27.59	57.7	1.3	no	yes	High School diploma	no
53	LCS	0.31	0.02	0.035	1.09	0.12	0.95	98.55	1.78	🔴 31,1	33.52	68.35	4.32	no	no	High School diploma	yes
54	APS	1.58	0.02	0.035	0.98	0.12	1.02	98.6	1.71	🔴 33,72	32.16	66.31	4.37	yes	no	Graduate degree	yes
55	AJMJ	0.083	1.04	0.035	0.82	0.12	2.78	116.55	1.8	🔴 35,97	36.87	72.79	4.39	yes	no	High School diploma	yes
56	DFS	0.69	0.02	0.035	0.08	0.12	1.21	88.65	1.73	🔴 29,62	29.05	59.16	4.07	yes	no	High School diploma	no
57	BSF	1.24	0.02	0.52	1.8	0.12	2.5	102.45	1.72	🔴 34,63	32.83	64.93	3.92	yes	no	High School diploma	no
58	AVS	0.72	0.35	0.035	1.3	0.12	1.21	94.9	1.69	🔴 33,23	32.59	66.77	3.35	yes	yes	Graduate degree	yes
59	WS	1.36	0.02	0.61	1.06	0.12	3.53	96.7	1.67	🔴 34,67	31.68	63.68	4.34	no	no	High School diploma	yes
60	NJM	0.8	0.15	0.62	3.76	0.12	2.29	63.45	1.71	🟢 21,7	25.02	50.94	1.93	no	no	Graduate degree	yes
61	AG	0.083	0.02	0.36	0.85	0.12	4.95	84.85	1.65	🔴 31,17	28.3	58.34	4.44	yes	no	High School diploma	yes
62	SFS	1.24	0.27	0.035	0.56	0.12	1.48	82.45	1.75	🔴 26,92	30.23	62.07	2.66	no	no	High School diploma	no
63	RG	0.99	0.33	2.02	1.35	0.12	10.87	75.2	1.74	🟢 24,84	27.04	56.36	2.98	yes	no	High School diploma	no
64	OAA	0.083	0.02	0.035	0.52	0.12	2.2	84.15	1.7	🔴 29,12	31.23	63.84	2.3	no	no	High School diploma	no
65	MOC	1.24	0.96	0.035	0.31	0.12	1.68	65.6	1.74	🟢 21,67	25.15	53.76	1.3	no	no	Graduate degree	no
66	DKN	0.45	0.2	0.34	0.28	0.12	2.41	68.5	1.66	🟢 24,86	24.98	52.39	1.71	no	no	Graduate degree	yes
67	ARP	0.083	0.02	0.035	0.4	0.12	0.67	71.95	1.77	🟢 22,97	27.01	56.04	3.24	no	no	High School diploma	yes
68	DVS	0.42	0.02	0.15	0.75	0.12	2.13	104.9	1.78	🔴 33,11	32.42	68.83	6.61	yes	no	Graduate degree	no
69	GSS	1.06	0.02	0.1	0.59	0.12	0.93	95.9	1.86	🔴 27,72	35.95	71	2.69	no	no	High School diploma	yes
70	REM	0.72	0.12	0.035	0.31	0.12	0.63	87.9	1.77	🔴 28,06	32.68	66.3	2.66	yes	no	High School diploma	yes
71	ISSJ	0.45	0.02	0.43	0.9	0.12	3.23	90.15	1.78	🔴 28,45	33.3	68.33	2.91	no	no	High School diploma	yes
72	TRP	0.8	0.48	0.035	0.08	0.12	0.49	108,00	1.91	🔴 29,6	42.76	84.93	2.8	yes	no	High School diploma	yes
73	GBG	0.69	0.33	0.58	0.69	0.12	2.27	88.5	1.8	🔴 27,31	31.97	65.88	3.34	no	no	High School diploma	no
74	GRS	0.42	0.02	0.035	0.16	0.12	1.34	82.35	1.71	🔴 28,16	27.59	56.86	3.76	yes	no	Graduate degree	yes
75	RO	0.083	0.02	0.32	0.42	0.12	0.89	81.1	1.77	🔴 25,89	33	68.78	1.62	yes	no	High School diploma	yes
76	MAL	0.42	0.02	0.035	0.2	0.12	0.63	82.15	1.81	🔴 25,08	29.08	61.23	3.28	yes	no	High School diploma	yes
77	WSD	1.65	0.59	0.53	0.52	0.12	0.89	94.5	1.72	🔴 31,94	30.96	64.31	4.73	yes	no	Graduate degree	yes
78	ASC	0.54	0.02	0.23	0.7	0.12	1.48	83.3	1.72	🔴 28,16	28.15	57.36	4.96	yes	no	High School diploma	yes
79	GAP	1.6	0.71	1.3	1.47	0.12	1.12	68,00	1.66	🟢 24,68	23.11	49.19	3.46	no	no	High School diploma	yes
80	JCR	0.083	0.02	0.035	0.08	0.12	0.13	81.9	1.71	🔴 28,01	27.32	57.55	3.11	no	no	Graduate degree	yes
81	LAC	0.99	0.02	0.035	0.42	0.12	0.89	81.95	1.74	🔴 27,07	30.25	62.58	2.15	yes	no	Graduate degree	no
82	DPS	0.083	0.02	0.41	1.92	0.12	5.62	120.55	1.76	🔴 38,92	34.72	69.34	7.21	yes	no	High School diploma	yes
83	DVO	0.083	0.02	0.69	0.98	0.12	7.7	77,00	1.7	🔴 26,64	25.96	56.05	3.31	no	no	High School diploma	yes
84	LFG	0.77	0.02	0.52	1.24	0.12	4.49	86.75	1.84	🔴 25,62	31.72	66.08	3.42	no	no	Graduate degree	yes
85	TSR	0.17	0.02	0.39	0.79	0.12	2.27	77.25	1.77	🟢 24,66	31.32	65.74	1.69	yes	no	High School diploma	yes
86	RRFR	0.083	0.02	0.38	1.18	0.12	7.21	84.85	1.68	🔴 30,06	29.3	60.18	3.67	yes	no	High School diploma	yes
87	AJLR	1.29	0.02	0.38	1.23	0.12	3.26	72.45	1.63	🔴 27,27	24.98	54.25	2.43	no	no	High School diploma	yes
88	HMR	1.16	0.33	0.71	0.4	0.12	4.42	81.85	1.77	🔴 26,13	30.69	63.81	2.19	yes	no	High School diploma	yes
89	LABS	1.09	1.04	0.65	0.82	0.12	0.74	86.6	1.78	🔴 27,33	32.5	68.34	1.59	yes	no	Graduate degree	yes
90	MAA	0.63	0.04	0.31	2.18	0.12	4.49	68.25	1.74	🟢 22,54	27.83	59.42	1.66	yes	no	High School diploma	yes
91	LHF	0.083	0.29	0.34	0.81	0.12	2.69	97.05	1.88	🔴 27,46	36.47	72.74	3.83	no	no	High School diploma	yes
92	DSO	0.083	0.87	0.77	1.58	0.12	7.97	72.2	1.77	🟢 23,05	28.42	58.67	1.59	yes	no	High School diploma	no
93	RHC	0.083	0.02	0.035	0.08	0.12	0.065	111.15	1.77	🔴 35,48	38.23	74.98	5.06	yes	no	High School diploma	no
Mean		0,68	0,20	0,30	1,06	0,13	3,19	86,58	1,75	28,50	30,66	62,76	3,40				
Std. Deviation		0,50	0,42	0,37	1,27	0,07	2,34	13,23	0,06	4,27	3,54	6,33	1,56				
Std. Error of Mean		0,05	0,04	0,04	0,13	0,01	0,24	1,37	0,01	0,44	0,37	0,66	0,16				
Lower 95% CI of mean		0,57	0,11	0,23	0,80	0,11	2,70	83,86	1,73	27,63	29,93	61,46	3,07				
Upper 95% CI of mean		0,78	0,29	0,38	1,32	0,14	3,67	89,31	1,76	29,38	31,39	64,07	3,72				
Minimum		0,08	0,02	0,04	0,08	0,12	0,07	60,30	1,63	19,69	23,11	49,19	1,30				
25% Percentile		0,13	0,02	0,04	0,50	0,12	1,48	79,00	1,70	26,01	28,26	57,79	2,53				
Median		0,63	0,02	0,15	0,82	0,12	2,76	84,70	1,74	27,72	30,44	62,20	3,10				
75% Percentile		1,06	0,22	0,41	1,14	0,12	4,37	94,70	1,78	31,12	32,76	67,21	3,89				
Maximum		2,15	2,58	2,02	8,36	0,78	12,24	127,40	1,91	40,31	42,76	84,93	10,03				
Range		2,07	2,56	1,99	8,28	0,66	12,18	67,05	0,28	20,62	19,65	35,74	8,73				

Supplementary data of the individual values of all variables analyzed. Values indicated with a red circle are outside the normal range. Values indicated with a green circle are inside the normal range.

Biochemical, physiological, and anthropometric parameters

We found that the waist circumference of all participants (n=93) was 97.7±11.1 cm, visceral fat volume was 3.4±1.5 L, and muscle mass was 30.6±3.5 Kg. The SBP and DBP were 130.3±15.9 and 77.87±11.3 mmHg, respectively. The fasting plasma glucose concentration was 92.5±10.6 mg/dL, plasma triacylglycerol concentration was 137.8±77 mg/dL, the HDL concentration was 42.4±10.6 mg/dL, the total cholesterol concentration was 187.2±44.2 mg/dL, and the percentage of glycated hemoglobin was 5.71±0.3%. The results for each study participant are presented in Supplementary Tables S1 and S2.

Additionally, the triacylglycerol by glucose index was determined to be 3.1± 0.2. The activities of the liver enzymes AST, ALT, and GGT were 27±12.8, 32±21, and 35.8±27.2 U/L, respectively. Plasma inflammatory cytokine concentrations in picograms/mL, were 0.13±0.07 for IL-1β, 0.20±0.42 for TNF-α, 1.06±1.27 for IL-6, 3.19±2.34 for IL-8, 0.30±0.37 for IL-10, and 0.68±0.50 for IL-12p. The median and quartile values and the confidence interval of these findings are in Supplementary Tables S1 and S2.

The between group comparisons revealed that the Daytime group presented higher AST activity (20.6 %, p <0.05), SBP (9.10%, p <0.001) and DBP (6.06%, p <0.05) values, and plasma IL-12p70 concentrations (26.7%, p <0.05) than the Nighttime group. However, no significant differences were detected when comparing body composition and the remaining parameters (WHR, HDL-c, blood glucose, triacylglycerol, CRP, TyG, ALT, GGT, or inflammatory cytokines (IL-6, IL-8, IL-10, and TNF-α) of the Daytime and Nighttime groups.

Concerning years of service as an MPO, the group with ≥10 years of experience presented a higher waist circumference (9.61%, p ≤ 0.001), WHR (5.62%, p ≤ 0.001), BMI (12.2%, p ≤ 0.001), absolute fat mass (34.5%, p ≤ 0.001), and visceral adipose tissue (41.7%, p ≤ 0.001) compared to the group of officers with ≤3 years on the job.

We also found that the group with ≥10 years exhibited elevated plasma triacylglycerol levels (31.6%, p≤0.001) and increased TyG indexes (3.59%, p≤0.001), SBP (5.91%, p ≤ 0.001), DBP (11.4%, p ≤ 0.001), and plasma IL-6 (38.4%, p ≤ 0.001) and IL-8 (38.6%, p ≤ 0.05) concentrations compared to MPOs working for ≤ 3 years.

Interestingly, the Daytime group with ≤3 years presented higher AST activity (22%, p<0.01) than the Nighttime group with the same years of experience. However, there was no difference in the activity of this enzyme between Daytime and Nighttime MPO groups with ≥10 years.