Gómez Oliva, E.; de la Vega Marcos, R.; Robles Pérez, J.J.; Ruiz Barquín, R.; Calvo Piernagorda, C.M.; Gómez Crespo, J.M. (2022). Psychophysiological Condition in the Performance of Sanitary-Military Tasks with Surgical Mask. Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte vol. 22 (86) pp. 399-418 Http://cdeporte.rediris.es/revista/revista86/artrespuesta1332.htm
DOI: https://doi.org/10.15366/rimcafd2022.86.013

ORIGINAL

PSYCHOPHYSIOLOGICAL CONDITION IN THE PERFORMANCE OF SANITARY-MILITARY TASKS WITH SURGICAL MASK

CONDICIÓN PSICOFISIOLÓGICA EN EL DESEMPEÑO DE TAREAS SANITARIO-MILITARES CON MASCARILLA QUIRÚRGICA

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THANKS

The authors wish to express their gratitude to the Central School of Physical Education, the Military School of Health and the Military School of Education Sciences (Spain) for their professionalism and support in carrying out this research.

Código UNESCO / UNESCO code: 610907 Evaluación del rendimiento (Psicología Industrial).
Clasificación Consejo de Europa / Council of Europe Classification: 17. Otras (Rendimiento deportivo) / Other (sport performance).

Recibido 28 de enero de 2020 **Received** January 28, 2020
Aprobado 24 de mayo de 2020 **Accepted** May 24, 2020

ABSTRACT

Using a quasi-experimental design with 19 health workers (33.7 ± 5.1 years), the importance of physical and cognitive condition and performance when wearing protective equipment with a surgical mask during training situations in significant contexts of military intervention has been analysed. Heart rate and its variability, glucose levels, thermoregulation, explosive strength and perceived effort in specific motor performance tasks (tapping test, tourniquet, ammunition), and cognitive and decisional performance (triage) were measured. The results indicate significant differences ($p < 05$) depending on the physical condition (blood glucose and explosive strength), gender (explosive strength and tourniquet), smoking habit (perceived effort) and specialty (glucose level) in the study group. In conclusion, the importance of physical and psychological training is highlighted to improve the operational response in health-military situations that require the use of a surgical mask.

KEY WORDS: surgical mask, protective equipment, psychophysiological abilities, fatigue, Covid.

RESUMEN

Se ha analizado, mediante un diseño cuasi-experimental con 19 sanitarios (33.7 ± 5.1 años), la importancia de la condición física, cognitiva y el rendimiento al portar un equipo de protección con mascarilla quirúrgica durante situaciones de entrenamiento en contextos significativos de intervención militar. Se midieron la frecuencia cardíaca y su variabilidad, los niveles de glucosa, la termorregulación, la fuerza explosiva y el esfuerzo percibido en tareas de rendimiento motor específicas (tapping test, torniquete, municionamiento), y de rendimiento cognitivo y decisional (triaje). Los resultados indican diferencias significativas ($p < 05$) en función de la condición física (glucemia y fuerza explosiva), del género (fuerza explosiva y torniquete), del hábito tabáquico (esfuerzo percibido) y de la especialidad de pertenencia (nivel de glucemia) en el grupo de estudio. Como conclusión, se destaca la importancia del entrenamiento físico y psicológico para la mejora de la respuesta operativa en situaciones sanitario-militares que requieren el uso de mascarilla quirúrgica.

PALABRAS CLAVE: mascarilla quirúrgica, equipos de protección, capacidades psicofisiológicas, fatiga, COVID.

INTRODUCTION

Currently, biological, chemical, nuclear or radiological attacks (NBQR) are increasingly frequent, where military or medical personnel require a high physiological and cognitive demand in order to carry out the tasks of their mission. In this way, the advance in technologies and equipment has been increasing, not only to ensure the health of our patients but also to protect that

of our professionals who need to use these protective equipment, improving their capacity and efficiency when wearing these devices, coming to be used on multiple occasions each year (Cantalejo-Pérez et al., 2017).

Throughout the world, healthcare personnel carry out their routine tasks of caring for patients with an infectious disease or handling potentially contagious samples. To ensure the integrity of your health, it is vitally important to follow the precautions and standards when using adequate Personal Protective Equipment (PPE) (Morelos-Ramírez, Ramírez Pérez, Sánchez-Dorantes, Chavarín-Rivera, and Meléndez-Herrada, 2014). On the other hand, the importance of carrying this type of equipment in tasks to prevent chemical or nuclear attacks, where the adequate preparation of military technicians for the proper development of their functions, including the necessary physical preparation, should not be forgotten. to fulfill their missions covering distances and carrying heavy self-protection equipment when appropriate (Arribas-Garde and Beléndez, 2015). According to the North Atlantic Treaty Organization, advances in the scientific and biotechnological field have led to an increase in the development of weapons of mass destruction (WMD) and bioterrorism against European civilians (NATO, 2015). Given the growing terrorist threat, most countries have created specialized Operational Units in the fight against ADM (Lorenzo Lozano et al., 2017), being in Spain the School of Nuclear, Biological and Chemical Defense (NBQ) (NBQ, 2012), the person in charge of analyzing, investigating and preparing the units for these tasks and the CBRN Regiment in charge of carrying out this work and guaranteeing the physical and mental training of its personnel. Achieving effective coordination and joint action implies that health professionals are highly prepared, not only in knowledge derived from the protocols of the Ministry of Health, but must also be in NBQR military procedures (Sánchez-Díaz, 2018).

As is evident, the health community must have well-trained personnel for this type of scenario (de la Calle-Prieto et al., 2018). As evidenced in different investigations, the use of protective equipment against biological risks can be especially hard and arduous for workers, imposing a very high stress load for any intervention (Anderson-Fletcher, Vera, and Abbott, 2015 ; Fogel et al., 2017; Verbeek et al., 2018). In this sense, factors such as exposure to heat and hypohydration would induce high states of physiological and psychological stress during the performance of the specific tasks to be performed (Adams et al., 2019).

According to several relevant investigations (Gómez, 1994; Ramírez et al, 2015), the use of protective equipment by professionals can affect their performance and fatigue. Some of the reasons mentioned would be a lower sensitivity, the effects of deterioration in the dermal and motor response in tasks that require prolonged use of protective equipment, a reduction in visual acuity and breathless sensation derived from the use of masks. These variables, not surprisingly, raise the importance and the need to link and study the training of physical condition with the operational response of the professionals who carry out this delicate work.

The study of the influence of stress and fatigue on military contextual performance is relatively recent in research (Vartanian et al., 2018). In this sense, Arnillas-Gómez (2017) points out that when health workers develop their healthcare function with a PPE, they present a significant increase in their state of anxiety. Information on the psychophysiological response allows developing specific training in real or simulated situations (Clemente-Suárez, de la Vega, Robles-Pérez, Lautenschlaeger, and Fernández-Lucas, 2016). Previous studies have analyzed changes in mood, fatigue, stress response, and cognitive performance in military situations (Lieberman, Tharion, Shukitt-Hale, Speckman, and Tulley, 2002, Balagué, Hristovski and Aragonés, 2011). It is interesting to know the processes of fatigue, both metabolically and physically and cognitively (Crowder, Beekley, Sturdivant, Johnson, and Lumpkin, 2007). Significant differences have been found at the metabolic level in the activation of the sympathetic nervous system and its associated responses depending on the equipment that the combatant carries, as well as depending on their abilities (Clemente-Suárez and Robles-Pérez, 2013). Cognitively, studies to date indicate that, in situations of stress, memory alterations, an increase in anxiety, and alterations in the perceptual and attentional response occur (Bonet, Parrado and Capdevila, 2017; Morris, 2015; Starcke, Wolf, Markowitsch, and Brand,2008).

Within the current scientific literature, the recent study that reveals significant psychophysiological differences when wearing a NBQR attack protection mask (Gómez-Oliva, Robles-Pérez, Ruiz-Barquín, Hidalgo-Bellota, and de la Vega, 2019) should be highlighted, not knowing if these may be present with minor respiratory protection equipment, type of surgical mask or filtering facepiece level 2 (FPP2). Thus, it is considered important to know whether these changes can occur with apparently more comfortable equipment, but also used by health-military personnel. In this sense, the results found in recent studies that suggest the great time uniformed with the equipment, as well as the effort made with it, are of special importance, notably decreasing the professional's psychophysiological conditions (Bonnin-Arias, Navarro-Valls, Lobato- Rincón, Ramírez-Mercado, and Sánchez-Ramos, 2010; Costello, Stewart, and Stewart, 2015 Simón-Grima., Estrada-Marcén, Cremades-Arroyos and Serrano-Ostáriz, 2020).

Finally, the importance of the study on this subject in the current context should be highlighted by COVID-19 (Huang et al., 2020), which has required enormous psychological and physiological demands on health personnel, both civilian and military, which implies the importance of studying the modulating role that training and improvement of physical condition can have as an optimizer of the operational response of military personnel in situations such as, unfortunately, we have been exposed and that can return to occur in the future. Due to the scarce bibliography on the subject and the relevance it has in the military context, as the main object of this study, and based on what is known about psychophysiological involvement in combatants wearing NBQR masks (Gómez-Oliva et al., 2019), The aim is to analyze how the psychophysiological, cognitive and performance response is affected by wearing protective gear with a surgical mask in significant contexts of military intervention, based on smoking habits, physical form and military membership. The achievement of the objectives set

will allow to know the work efficiency of health professionals when they need to equip themselves with this type of respiratory protection devices in high stress contexts, and thus be able to guide future studies that point to a specific preparation if necessary.

METHOD

The applied research design is pre-post quasi-experimental prospective quantitative, consisting of an experimental group and a non-equivalent control group (León and Montero, 2007). Sampling is incidental for convenience.

Participants

The target population corresponds to military personnel commissioned to the Al Hoceima detachment (Islands and Peñones of Spain) for a total period of one month and six days in the second third of the year 2018. The sampling was non-random and incidental in nature. Voluntary participation in the research, leaving the sample limited to a total of 19 soldiers (age 33.7 ± 5.1 years, body mass index 26.7 ± 4.4 kg / m2, physical condition 73.5 ± 14 points and smoking habit 2.2 ± 2.4 points).

The different specialties of the study subjects were: anti-aircraft artillery (AAA), field artillery (ACA), infantry (INF), sea company (MAR) and transmissions (TRANS).

All the participants had passed the Army's internal physical tests in that same year. Those with a personal history of chronic relevant disease, subjects with pharmacological treatment, subjects with BMI ≤ 20 or BMI ≥ 38 and subjects with high experience in wearing any type of mask were excluded.

All the participants completed an informed consent form and the study was proposed according to the Declaration of the 18th World Medical Assembly in Helsinki (1964). Two randomly assigned groups were formed, not establishing an equivalent control group, the experimental group with 10 soldiers, which involved the use of a surgical mask, and the control group, with 9 (n = 19). The groups based on each of the study variables were distributed into: i) Age (Group 1 (E1 n = 9): ≤ 33 years and Group 2 (E2 n = 10):> 33 years); ii) Weight and height for BMI (Diet, 1986) (Group 1 (BMI1 n = 7): ≥ 20 and <25, Group 2 (BMI2 n = 8): ≥ 25 and <30 and Group 3 (BMI3 n = 4): ≥ 30); iii) Gender (Group 1 (man = 17) and Group 2 (woman = 2): Woman); iv) Level of physical preparation -is governed by the annual physical tests passed by military personnel, through the application of the General Test of Physical Condition (Doctrine, 2017), weighted by gender and age (Group 1 (TGCF1 n = 9) : ≥ 75 points and Group 2 (TGCF2 n = 10): <75 points) -; v) Specialty and smoking habit: it was valued based on the Fagerström Test (Vega-Torrens, 2018) (Group 1 (Fn n = 10): Non-smokers, Group 2 (Fdb n = 6): Smoker with low dependence (≤ 3 in Fagerström) and Group 3 (Fdma n = 3): Smoker with moderate-high dependence (≥ 4 in Faferström).

Instruments

The psychophysiological variables were measured as follows:

- Heart rate, cardiac variability: OmegaWave Coach + device (Omegawave Ltd., Espoo, Finland). Innovative device that evaluates the sympathetic and parasympathetic nervous systems through an elastic band on the chest and electrodes on the dominant hand and forehead. The Coach + program was used with an iPad mini 2 32GB. This device records variables such as HRV and potential DC (Morris, 2015).

- Blood Glucose: GLUCOMEN LX PLUS brand glucometer. It was performed using a capillary sample (Hurtado, 2010; Martínez – Jimenez, 2007).

- Thermoregulation: T-ONE model infrared operating thermometer.

- Explosive force: Jump countermovement (CMJ) with longitudinal structure (Clemente-Suárez and Robles-Pérez, 2013).

- Perceived effort: Borg Scale (Clemante – Suárez and Robles – Pérez, 2013).

- Motor performance: Tapping test. It measures Spontaneous motor time and its regulation (fast, comfortable and slow rhythms) by tapping in four (4) 10x10cm quadrants. Test that presents a Cronbach's alpha of .88 (Estrada-Contreras et al., 2013).

The sanitary-military tests to be carried out were:

- Placement of a Tourniquet to another subject. An ad-hoc Check-list Measurement Scale was created to assess its correct placement. The items to assess were: above the lesion 5-7cm and avoiding joints, secure the rod, tighten until there is no pulse in the limb, note the time of placement and time less than 30 ".

- Resolution of three Triage cases by the START method in a total of 45” maximum.

- Ammunition a complete HK model pistol magazine, a total of 15 9mm parabelum shells, in the shortest possible time.

The surgical masks used were of the 3M brand, model with four adjustment straps. They were placed in the experimental group, after performing the first batch of military-health tasks, remaining in place for 3 minutes and starting the tasks again carrying them. In relation to the time the mask is worn, it is based on the dynamics of energy supply and consumption. Aerobic metabolism may require up to three minutes for activation (Vinuesa Lope and Vinuesa Jimenez, 2016) and therefore they were maintained for that time before resuming the protocol. The participants were also equipped with a double pair of gloves, as

established by the reference NBC standard (NBQ, 2012), also providing a possible increase in the difficulty of performing manual precision tasks (Álvarez and Ledesma, 2018; López, Polo, Fortún, Navarro, and Centella, 2018).

Process The psychophysiological variables measured in the protocol were as follows: heart rate (Omega Wave® (OW)), thermoregulation (Temperature), blood glucose (Glycemia), variability of heart rate (OWRMSSD) and explosive force (CMJ). The psychological variables taken were the perceived effort (Borg) and the motor performance (Ttest). On the other hand, variables were analyzed according to groups such as age, weight and height (BMI), gender, military specialty, basic physical training (TGCF) and smoking habit (Fagerström) of the participants. Two days prior to carrying out the protocol, a training session was held as a reminder of the tasks required in the investigation: a) Placement of the Tourniquet and b) Triage in care of multiple victims according to the START method (standard system in the Armed Forces) (Kuckelman, Derickson, Long, and Martin, 2018). At the control level, the intake of food and beverages was controlled, so that no participant could consume stimulating substances during the study. The pre-post of the military activities was evaluated (Figure 1), the surgical mask and double glove (GE) or no mask and double glove for three minutes (GC) were placed. Immediately after, the specific military tasks were carried out again and, finally, the dependent variables indicated were measured again.

Figure 1. Study protocol. Variable sequence and measurement time

Analysis of data

Descriptive statistics were used, finding absolute frequencies and percentages. The arithmetic mean, standard deviation, coefficient of variation, minimum, maximum, range and normality of the sample (Shapiro-Wilk) were used as central tendency and dispersion statistics. Wilcoxon was used to differentiate statistical calculation of intragroup samples and the Mann-Whitney U test was used to compare the independent groups. 0.05 was taken as p value. The collected data was processed with the SPSS Statistics Version22 program (version 22, SPSS Inc. Chicago, III., USA).

Subsequently, groups were formed to assess the psychophysiological conditions linked to the use of masks according to age, weight and height, gender, level of physical training, military specialty and smoking. These groups were distributed into: i) Age (Group 1 (E1): ≤ 33 years and Group 2 (E2):> 33 years); ii) Weight and height for BMI (Diet, 1986) (Group 1 (BMI1): ≥ 20 and <25, Group 2 (BMI2): ≥ 25 and <30 and Group 3 (BMI3): ≥ 30); iii) Gender (Group 1 (V): Male and Group 2 (M): Female); iv) Level of physical preparation - is governed by the annual physical tests passed by military personnel, through the application of the General Test of Physical Condition (Doctrine, 2017), weighted by gender and age (Group 1 (TGCF1): ≥ 75 points and Group 2 (TGCF2): <75 points) -; v) Specialty (AAA, ACA, INF, MAR and TRANS) and smoking: it was evaluated according to the Fagerström Test (Vega-Torrens, 2018) (Group 1 (Fn): Non-smokers, Group 2 (Fdb): Smoker with low dependence (≤ 3 in Fagerström) and Group 3 (Fdma): Smoker with moderate-high dependence (≥ 4 in Faferström).

RESULTS

In relation to the dependent variables, the data obtained in the intragroup comparison (Table 1), indicates that in the group without mask there is a significant decrease in capillary blood glucose and a significant increase in explosive force (p <.05). In the experimental group, the temperature decreased significantly, maintaining a confidence level greater than 95%, after performing the military-health tasks with a surgical mask. There were no statistically significant differences between the two groups in the initial perceived effort (6 ± 0), increasing significantly in all the measures of the experimental protocol and being higher in the group wearing the mask. Table 1. Physiological and psychological variables before and after military-health tasks, between groups.

	PRE	POST	z	p
SIN MASCARILLA QX				
HR	[illegible]	[illegible]	[illegible]	[illegible]
OWFC (lpm)	64±11.1	62.1±5.6	-.211	.833
OWRMSSD (lpm)	61.4±35.1	52.7±25.8	-1.718	.086
Temperatura (Cº)	36.3±0.3	36.2±0.3	-.417	.677
Glucemia (mg/dl)	96.1±9	85.7±12.1	-2.194	.028*
TTest1(1-2)	37.8±13.6	36±15.5	-.654	.513
TTest1(1-3)	37.8±13.6	34.6±13.5	-.841	.400
TTest1(1-4)	37.8±13.6	34.9±17.7	-.211	.833
TTest4(1-2)	0.1±0.3	0.3±0.7	-1.000	.317
TTest4(1-3)	0.1±0.3	0.3±0.7	-.816	.414
TTest4(1-4)	0.1±0.3	0.7±0.9	-1.890	.059
Borg1-2 (0-10)	6	7.7±1.9	-2.060	.039*
Borg1-3 (0-10)	6	7.9±2.1	-2.041	.041*
Borg1-4 (0-10)	6	8.6±2	-2.530	.011*
CMJ (cm)	180.4±31.5	189.9±28.1	-2.103	.035*
TriajeTiempo (seg.)	55.5±25.9	49.4±20.6	-1.955	.051
TriajeFin (seg.)	2.2±0.7	1.9±0.8	-.750	.453
TorniqueteTiempo (seg.)	49.5±13.9	40.8±12.6	-1.836	.066
TorniqueteFin (seg.)	3±0.9	3.3±0.5	-1.000	.317
MunicionTiempo (seg.)	69.6±27.1	74.5±24.7	-1.007	.314
CON MASCARILLA QX				
HR	69.7±13.4	72.8±14.3	-1.373	.170
OWFC (lpm)	73.3±18.6	77.5±32.1	-.059	.953
OWRMSSD (lpm)	50.2±40.2	49.6±24	-.357	.721
Temperatura (Cº)	36.4±0.4	36.3±0.4	-1.997	.046*
Glucemia (mg/dl)	98±16.8	98.6±21	-.153	.878
TTest1(1-2)	34±15.4	33.4±15.3	-.480	.631
TTest1(1-3)	34±15.4	32.3±15.7	-1.366	.172
TTest1(1-4)	34±15.4	31.5±15.2	-1.548	.122
TTest4(1-2)	2.7±1.3	0.4±0.7	-1.000	.317
TTest4(1-3)	2.7±1.3	0.2±0.4	-1.342	.180
TTest4(1-4)	2.7±1.3	0.6±0.8	-.577	.564
Borg1-2 (6-20)	6	8.2±1.7	-2.536	.011*
Borg1-3 (6-20)	6	8.2±2.3	-2.388	.017*
Borg1-4(6-20)	6	9.9±3.54	-2.527	.012*
CMJ (cm)	186.3±28.1	185.5±27.7	-.298	.766
TriajeTiempo (seg.)	45.6±17.5	48.8±19.1	-.770	.441
TriajeFin (seg.)	2.7±1.3	2.3±1.2	-.604	.546
TorniqueteTiempo (seg.)	46.4±15	44.2±16.4	-.459	.646
TorniqueteFin (seg.)	3.4±0.8	3.5±1	-.264	.792
MunicionTiempo (seg.)	67.9±23.4	124.4±193.1	-.561	.575

*p<.05

When making the comparison between independent groups (Table 2), no significant differences were obtained in any of the variables. Table 2. Physiological and psychological variables between groups.

	SIN MASCARILLA QX	CON MASCARILLA QX	z	P
PRE				
OWFC1 (lpm)	64±11.1	73.3±18.6	-1.144	.253
OWRMSSD1 (lpm)	61.4±35.1	50.2±40.2	-.939	.348
Temperatura1 (Cº)	36.3±0.3	36.4±0.4	-.452	.651
Glucemia1 (mg/dl)	96.1±9	98±16.8	-.041	.967
TTest1(1)	37.8±13.6	34±15.4	-1.067	.286
TTest2(1-4)	0.1±0.3	2.7±1.3	-1.432	.152
Borg1 (6-20)	6	6	.000	1.000
CMJ1 (cm)	180.4±31.5	186.3±28.1	-.408	.683
TriajeTiempo1 (seg.)	55.5±25.9	45.6±17.5	-1.022	.307
TriajeFin1 (seg.)	2.2±0.7	2.7±1.3	-1.365	.172
TorniqueteTiempo1(seg.)	49.5±13.9	46.4±15	-.490	.624
TorniqueteFin1 (seg.)	3±0.9	3.4±0.8	-.910	.363
MunicionTiempo1 ((seg.)	69.6±27.1	67.9±23.4	-.163	.870
POST				
HR2	63.5±6.9	72.8±14.3	-1.324	.185
OWFC2 (lpm)	62.1±5.6	77.5±32.1	-1.474	.141
OWRMSSD2 (lpm)	52.7±25.8	49.6±24	-.163	.870
Temperatura2 (Cº)	36.2±0.3	36.3±0.4	-.205	.837
Glucemia2 (mg/dl)	85.7±12.1	98.6±21	-1.470	.141
TTest3(1-2)	36±15.5	33.4±15.3	-.449	.653
TTest3(1-3)	34.6±13.5	32.3±15.7	-.409	.683
TTest3(1-4)	34.9±17.7	31.5±15.2	-.285	.775
TTest4(1-2)	0.3±0.7	0.4±0.7	-.317	.751
TTest4(1-3)	0.3±0.7	0.2±0.4	-.230	.818
TTest4(1-4)	0.7±0.9	0.6±0.8	-.184	.854
Borg2 (6-20)	7.7±1.9	8.2±1.7	-.760	.447
Borg3 (6-20)	7.9±2.1	8.2±2.3	-.466	.641
Borg4 (6-20)	8.6±2	9.9±3.54	-.619	.536
CMJ2 (cm)	189.9±28.1	185.5±27.7	-.531	.595
TriajeTiempo2 (seg.)	49.4±20.6	48.8±19.1	-.082	.935
TriajeFin2 (seg.)	1.9±0.8	2.3±1.2	-1.069	.285
TorniqueteTiempo2 (seg.)	40.8±12.6	44.2±16.4	-.408	.683
TorniqueteFin2 (seg.)	3.3±0.5	3.5±1	-.276	.783
MunicionTiempo2 (seg.)	74.5±24.7	124.4±193.1	-.572	.568

*p<.05

When comparing the groups based on BMI (Table 3), significant differences were obtained, in favor of the overweight group compared to the normal weight group, as they performed the task more quickly (p <.05). Regarding gender,

significant differences were found in the explosive strength of the beginning and end of the protocol and in the time of placement of the tourniquet the first time the task was performed. The female gender has a lower explosive force, however, the time to put the tourniquet on the first time they are done is less than that of men. Taking into account the level of physical preparation, significant differences were found (Table 3) in the capillary glycemia that they present both at the beginning and at the end of the study. The group with the best physical preparation starts and ends with a significantly lower glycemia. Likewise, significant differences were obtained in relation to the explosive force. The group with better physical condition and lower glycemic value also presented a higher explosive force (p <.05). In the comparison based on the smoking habit of the participants, significant differences were found (Table 3) between the group of nonsmokers and smokers with low dependence on the third and fourth scales of perceived effort of the protocol. Smokers with low dependence presented less sensation of perceived effort (Table 3). Taking into account the different military specialties, there are differences in the final glycemic protocol between the Anti-Aircraft Artillery group in comparison with the Infantry and Marine groups. Anti-aircraft artillery has a higher blood glucose value at the end of the intervention compared to the rest of the specialties.

In relation to the age of the participants, statistically significant differences were found in the heart rate at the beginning (Table 3), with the longest-lived group registering the lowest values in initial heart rate.

Table 3. Other variables that can influence.

GRUPO	x̄ ± σ 1	x̄ ± σ 2	x̄ ± σ 3	x̄ ± σ 4	x̄ ± σ 5	≠	z	p
IMC								
MunicionTiempo1 (sec.)	84.9±22.3	56.2±14.8	65.6±27.3			1-2	-2.777	.005*
Género								
CMJ1 (cm)	188.4±25.4	138±7.1				1-2	-1.993	.046*
TorniqueteTiempo1 (sec.)	52.5±22.5	31.5±1.1				1-2	-1.993	.046*
CMJ2 (cm)	191.9±20.8	137±5.6				1-2	-2.259	.024*
Condición Física								
Glycemia1 (mg/dl)	91.6±10.6	104.9±12.8				1-2	-2.456	.014*
CMJ2 (cm.)	200.7±18.7	173±25.7				1-2	-2.369	.018*
Glycemia2 (mg/dl)	83.1±13.6	104.1±14.8				1-2	-2.655	.008*
Hábito Tabáquico								
	9.6±2.2	6.3±0.5	7.3±1.5			1-2	-2.510	.012*
Borg4 (0-10)	11.2±3.1	7.6±1.1	7.7±1.5			1-2	-2.296	.022*
MunitionTime2 (sec.)	131.8±191.2	58±10	87.3±16			1-2	-2.049	.040*
						2-3	-2.286	.022**
Especialidad Militar								
Glucemia2 (mg/dl)	107±14.4	93.4±15.5	76±2.8	76±14.1	82	1-3	-2.058	.040*
						1-4	-2.058	.040*
						1-5	-2.058	.040*
Edad								
OWFC1 (lpm)	76.3±17	62.7±12				1-2	-2.207	.027*

*p<.05; ≠diferencias entre qué grupo

DISCUSSION

It seems interesting to compare with studies such as that of Martín-Rodríguez (2017), on the physiological repercussions of the use of personal protective equipment against biological risks, where among its conclusions an homogeneous distribution of the dependent variables by sex is observed, finding no statistically differences significant, different from what was found in the present study, having found differences that allude to the explosive force or the time in placing a tourniquet. Martín-Rodríguez (2017) also states in his study that professionals who have a medium-high level of physical activity tolerate work with a biological protection suit better, coinciding with our study when we compared by physical condition of the subjects, where we spoke of a statistically significant decrease in blood glucose in the group with better

physical condition versus the opposite. From there, a very relevant finding can be obtained that makes us reflect on possible future lines of study, where we explore whether this decrease is caused by having had a better performance, or conversely, that decrease is in response and adaptation to the stress situation generated (Marik and Bellomo, 2013).

Martín-Rodríguez (2017) obtained as a finding that a high percentage of subjects exceeded their recommended anaerobic threshold, assuming a significant effort, in our case there are significant differences in the effort perceived by the participants when wearing a respiratory protection mask according to the Scale. from Borg. He also comments that hemoglobin decreases, temperature increases and they show a pattern of poor stress tolerance after the use of personal protective equipment, and that these conditions are maintained after a period of 10 '. In the present study, it can be said that after wearing the respiratory protective surgical mask, a significant decrease in temperature is obtained, not coinciding with the increase posed by Martín-Rodríguez, but with the one found by Gómez-Oliva et al (2019) . This decrease in temperature leads us to the need for specific training to maintain physical conditioning and operability despite encountering adverse conditions. In future studies, it would be interesting to investigate a rule that allows evaluating what type of professionals based on their physical qualities have better adaptability and tolerance at work in situations of NBQR incident.
In the study on the physiological responses of police officers wearing NBQ equipment in simulations (Blacker et al., 2013), they conclude that there is an increase in body temperature, although they found no significant differences. In our case, as already mentioned, a decrease was found and it was significant. Sinoauricular Node Dysfunction (NSA) increases with age, although not all older adults are affected in the same way (Moghtadaei et al., 2016; Monfredi and Boyett, 2015). Regarding heart rate, Stein et al. (2010) analyze the reaction time of workers who carry equipment, observing how the frequency increases in workers, although without finding significant differences. In our research, there are significant differences in heart rate according to age groups, being lower in the group with advanced age, both at the beginning and at the end of the intervention. However, it is consistent with Stein that the heart rate increases at the end of the intervention in the team that wears respiratory protection masks, although there are no significant differences with the control group. Blood glucose levels are higher in the group with the worst physical condition, which highlights the importance of physical training for Units that need to use this type of equipment. These results point in the same direction to those found by Clemente-Suárez and Robles-Pérez (2012), when analyzing the soldiers' response to symmetrical and asymmetric combat conditions. Continuing with blood glucose levels, there are significant differences between the specialty of AAA versus INF and MAR. No studies on blood glucose have been found in this specialty, but at the beginning of its history experts suggest that they should regulate oscillations inherent in their muscular activity (Purkiss, 1954), considering the treatment of psychophysiological problems to be useful as they offer analogies and correlations that help a better understanding of complex phenomena, for which they must be prepared.

In the study carried out by Maynard, Kao and Craig (2016), on military protection and security equipment against EVE attacks, the perceived effort increases when wearing security equipment, as occurs in the present study with surgical masks, although not make a significant difference compared to the control group. Thus, it is considered important to prepare any military man who may face carrying similar equipment for long periods of time. Considering the age groups, there are several factors that reduce muscle strength, mainly the aging process, physical activity decreases with age and sedentary behaviors increase (Donini et al., 2013; Merizalde, Trujillo, López, Mancero, and Saá, 2019). In the case of this study, there were no differences in explosive force or ammunition related to age groups. However, in relation to the BMI groups, they found that people with obesity have decreased muscle strength in the lower extremities and experienced a more pronounced decrease in walking speed compared to people with BMI <25 (Crespo, Keteyian , Heath, and Sempos, 1996; Merizalde et al., 2019), not coinciding with the results found in the present protocol, since the group with weight> 25 performed a munition significantly faster than participants with BMI <25. In the study by Chuquimango et al (2017) on reasons that intervene in the use of personal protective equipment, unlike ours, the female population is higher, reaching 83% of the total population. They also comment that workers report not using personal protective equipment due to the discomfort it generates in carrying out their work, with respiratory protection being the highest percentage, which could be related to the perceived effort reported by the participants in our study.

In the study carried out by Chávez et al (2012), they analyzed the Borg scale and its relationship with oxygen saturation in a group of 22 patients (14 smokers and 8 non-smokers), obtaining a correlation between both variables and no significant difference in the perceived effort between smokers and non-smokers. In the case of the present study presented with surgical masks, smokers with low dependence showed significantly lower perceived exertion than non-smokers. Surprisingly, the performance of health-military tasks, although not significantly, was achieved in a shorter time in the second round of protocol execution, coinciding with results found in the study on NBQR masks (Gómez-Oliva et al., 2019) and studies that analyze fine motor skills and decision making in combat situations (Maynard, Kao, and Craig, 2016; Oksa, Rintamäki, and Mäkinen, 2006). As a high percentage of failures in tourniquet placement have been found as occurs in the recent study on NBQR masks, it is considered important to carry out specific training sessions (Clemente-Suárez et al., 2016; Grossman and Siddle, 2000), aimed at achieving a proper use and use of the tourniquet as a fundamental element to treat preventable deaths on the battlefield. Finally, commenting on the limitations of the study, there was difficulty in comparing by age, gender, specialty and basic physical preparation, since the sample size of the groups was heterogeneous. However, the external validity of the results obtained is high, given that the sample is representative, representing almost 65% of the target population. On the other hand, the chronobiological and chronopsychological aspects of the study were not controllable due to difficulties with military service and job performance, considering them of interest in some of the variables, highlighting the temperature where throughout the day there may be oscillations in the participants (Costa et al., 2016). However, it will represent an advance in the

investigation of the importance of psychophysiological conditions, by using respiratory protection equipment for a long period of time, due to the scarce literature that exists on it. All the information could point to future studies aimed at improving these conditions, thus improving work efficiency and the failures that can be caused in the removal of equipment, due to the conditions suffered during its use.

Thus, as the main implications of this work, highlight that the data has been collected by the researcher himself, ensuring internal reliability and, in addition, has allowed an approach to how part of the NBQR protection team can affect, showing interest and empathy for the demands of fighters and professionals who feel uncertain in the circumstances where they need to equip themselves with an NBQR suit.

CONCLUSIONS

When observing the different dependent variables wearing a mask and not doing it during the protocol, the following statistically significant differences can be observed: - Control group subjects: Statistically significant differences in the Perceived Effort Scale comparing the initial one before starting the protocol with the Perceived Effort after carrying out the first medical-military tasks, three minutes after putting on a double pair of gloves and immediately after finishing the second health-military tasks. Furthermore, there are statistically significant differences in the explosive force of the participants, this being higher at the end of the protocol and capillary blood glucose, this being lower at the end of the tests.

- Experimental group subjects: Statistically significant differences were found in the Perceived Effort Scale in the same measures as the control group, as well as in the temperature at the end of the protocol, being lower after wearing the mask and performing all the tasks. By way of conclusion, the present study serves as the basis for future research that seeks to analyze the training of different physical and psychological variables to improve operational performance with the use of a mask.

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