



## Trabajo Original

Valoración nutricional

### Effect of the COVID-19 quarantine on body mass among combat sports athletes

#### *Efecto de la cuarentena de la COVID-19 sobre el peso corporal de los practicantes de deportes de combate*

Tomás Herrera-Valenzuela<sup>1,2</sup>, José Jairo Narrea Vargas<sup>3</sup>, Rodrigo Merlo<sup>4</sup>, Pablo Valdés-Badilla<sup>5</sup>, Carolina Pardo-Tamayo<sup>1</sup>, and Emerson Franchini<sup>6</sup>

<sup>1</sup>Escuela de Ciencias del Deporte. Facultad de Salud. Universidad Santo Tomás (UST). Santiago, Chile. <sup>2</sup>Escuela de Ciencias de la Actividad Física, el Deporte y la Salud. Universidad de Santiago de Chile (USACH). Santiago, Chile. <sup>3</sup>Escuela de Nutrición Humana. Universidad Privada Norbert Wiener. Lima, Perú. <sup>4</sup>Escuela Nacional de Entrenadores Deportivos. Mexico City, Mexico. <sup>5</sup>Physical Education Pedagogy. Facultad de Educación. Universidad Autónoma de Chile. Temuco, Chile. <sup>6</sup>Martial Arts and Combat Sports Research Group. School of Physical Education and Sport. University of São Paulo. Brazil

### Abstract

**Introduction:** to combat the COVID-19 pandemic governments have adopted measures such as quarantine and social distancing.

**Objective:** the main objective of the present study was to analyze the impact of COVID-19 quarantine on body mass in combat sports athletes.

**Methods:** we conducted a cross-sectional, prospective, multi-center study that evaluated 234 men (mean age and standard deviation, 29 ± 10 years) residing in Argentina (n = 38); Bolivia (n = 1); Brazil (n = 105); Chile (n = 30); El Salvador (n = 1); Spain (n = 22); Mexico (n = 22) and Peru (n = 15). Of these, 12 practiced Brazilian jiu-jitsu (BJJ), 54 boxing, 67 judo, 13 karate, 52 kick boxing & muay thai (KB & MT), 9 mixed martial arts (MMA), and 27 taekwondo (TKD). An online survey was created using Google Forms. It was implemented between April 4<sup>th</sup> and April 17<sup>th</sup>, 2020. Athletes were consulted about their body mass before starting the quarantine and after 20 ± 5 days of quarantine.

**Results:** athletes in all combat sports were heavier during quarantine as compared to pre-quarantine (p < 0.001, d = 0.12).

**Conclusions:** combat sports athletes experienced an increase in body mass during the COVID-19 quarantine.

#### Keywords:

Martial arts. Athletic performance. Weight loss. Body weight changes.

### Resumen

**Introducción:** para combatir la pandemia de COVID-19, los gobiernos han adoptado medidas como la cuarentena y el distanciamiento social.

**Objetivo:** el principal objetivo del presente estudio fue analizar el impacto de la cuarentena por COVID-19 sobre la masa corporal en atletas de deportes de combate.

**Métodos:** realizamos un estudio transversal, prospectivo y multicéntrico que evaluó a 234 hombres (media de edad y desviación estándar, 29 ± 10 años) que residen en Argentina (n = 38); Bolivia (n = 1); Brasil (n = 105); Chile (n = 30); El Salvador (n = 1); España (n = 22); México (n = 22) y Perú (n = 15). De estos, 12 practicaban jiu-jitsu brasileño (BJJ), 54 boxeo, 67 judo, 13 karate, 52 kick boxing y muay thai (KB y MT), 9 artes marciales mixtas (MMA) y 27 taekwondo (TKD). Se creó una encuesta en línea usando Google Forms. Se implementó entre el 4 y el 17 de abril de 2020. Se preguntó a los deportistas sobre su masa corporal antes de comenzar la cuarentena y después de 20 ± 5 días de cuarentena.

**Resultados:** los atletas de todos los deportes de combate resultaron más pesados durante la cuarentena que durante la precuarentena (p < 0,001, d = 0,12).

**Conclusiones:** los atletas de deportes de combate presentaron una mayor masa corporal durante la cuarentena a causa de la COVID-19.

#### Palabras clave:

Artes marciales. Desempeño atlético. Pérdida de peso. Cambios de peso corporal.

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#### Correspondence:

Emerson Franchini. Martial Arts and Combat Sports Research Group. School of Physical Education and Sport. University of São Paulo. Brazil. CEP: 05508-030 e-mail: [efranchini@usp.br](mailto:efranchini@usp.br)

## INTRODUCTION

The World Health Organization decreed the novel coronavirus infection (COVID-19) a pandemic on March 11, 2020. As of June 8<sup>th</sup>, 2020, it has generated 7,068,144 infection cases and 404,142 deaths (1). This situation has had a strong impact on people's lives, and governments have implemented different measures, including quarantines and social distancing, with the aim of flattening the contagion curve. The sports world has also experienced the effects of the pandemic, having to suspend sporting events, professional tournaments, large-scale activities, and even postponing the Olympic Games in Tokyo. Consequently, athletes have had to adapt their training routines trying to maintain their sports preparation at home.

For their part, combat sports athletes, who by regulation compete according to body weight divisions to promote sports equity in terms of body mass (2), appear to be especially affected. Many athletes use rapid weight loss procedures (a 2 % to 10 % reduction in body mass during the week preceding the competition) to compete in lighter divisions and against smaller and weaker opponents (2-5). Therefore, most combat sports athletes train with a body mass greater than their competition division (6). However, after the official weigh-in, there is a rapid gain in body mass to compete (6-12), generating continuous changes in the body mass of these athletes. This type of practice can cause serious health problems (13), including death in extreme cases (14).

On the other hand, with the restrictions that have occurred due to quarantines and social distancing orders, it is likely that athletes have changed their eating habits and training volume. These factors could generate rapid increases in body mass, a situation where, once quarantine ends and normal competition schedule resumes, athletes will have to reach their usual training body mass, and it will likely be more difficult to achieve their competition weight category. Thus, the main objective of the present study was to analyze the impact of COVID-19 quarantine on body mass in combat sports athletes.

## MATERIAL AND METHOD

### PARTICIPANTS

We conducted a cross-sectional, prospective, multi-center study that evaluated 234 men (mean age and standard deviation,  $29 \pm 10$  years) residing in Argentina ( $n = 38$ ); Bolivia ( $n = 1$ ); Brazil ( $n = 105$ ); Chile ( $n = 30$ ); El Salvador ( $n = 1$ ); Spain ( $n = 22$ ); Mexico ( $n = 22$ ) and Peru ( $n = 15$ ). Of these, 12 practiced Brazilian jiu-jitsu (BJJ), 54 boxing, 67 judo, 13 karate, 52 kick boxing & muay thai (KB & MT), 9 mixed martial arts (MMA), and 27 taekwondo (TKD) (Table I).

All participants were informed of the purpose of the study and signed an informed consent form authorizing the use of their information for scientific purposes. The research protocol was reviewed and approved by the Ethics Committee at the Universidad Santo Tomás de Chile, and was developed following the provisions of the Declaration of Helsinki.

### MEASUREMENTS

A multi-center, cross-sectional study was carried out in which an online survey was created using Google Forms. It was implemented between April 4<sup>th</sup> and 17<sup>th</sup>, 2020. Athletes were consulted about their body mass before starting quarantine and after  $20 \pm 5$  days of quarantine.

The online survey contained 11 questions, which were organized as follows: 7 questions on sociodemographic characteristics (country, sex, age, height, combat sport, competitive level, years of practice of the sport); 2 quarantine-related questions (status and duration); and 2 questions related to body mass (body mass in the week prior to the start of quarantine and current body mass). To administer the survey, representatives were used to disseminate and monitor the information through social media platforms such as Facebook, Twitter, Instagram,

Table I. Athlete characteristics

Group	Age (years)	Height (m)	Experience (years)	Days in quarantine
BJJ	$35 \pm 9$	$1.78 \pm 0.06$	$9 \pm 7$	$21 \pm 3$
Boxing	$29 \pm 9$	$1.72 \pm 0.07$	$10 \pm 7$	$19 \pm 5$
Judo	$29 \pm 9$	$1.73 \pm 0.07$	$18 \pm 10$	$20 \pm 4$
Karate	$30 \pm 13$	$1.75 \pm 0.06$	$20 \pm 11$	$18 \pm 6$
KB & MT	$33 \pm 9$	$1.73 \pm 0.07$	$13 \pm 10$	$20 \pm 4$
MMA	$32 \pm 7$	$1.72 \pm 0.05$	$12 \pm 7$	$20 \pm 6$
TKD	$27 \pm 9$	$1.79 \pm 0.09$	$13 \pm 6$	$21 \pm 4$
Total	$30 \pm 9$	$1.74 \pm 0.07$	$14 \pm 9$	$20 \pm 5$

BJJ: Brazilian jiu-jitsu; KB & MT: kick boxing & muay thai; MMA: mixed martial arts; TKD: taekwondo.

WhatsApp, email, and athlete databases. Inclusion criteria included: a) being 18 years of age or older; b) having been quarantined at least one week at survey completion; c) combat sport athlete; d) at least three years of experience in a combat sport. A total of 564 surveys were collected, of which 7 were eliminated due to their being incomplete, 17 due to typing errors, 5 for failing to completing the informed consent form, and 301 for not meeting the inclusion criteria. Thus, 234 surveys were available for analysis.

**STATISTICAL ANALYSIS**

Data were exported to a 2016 Microsoft Office Excel® electronic spreadsheet for subsequently analyses with the software program SPSS® version 26.0. Mean and standard deviation were calculated for all variables. In addition, the normality of variables was obtained using the Kolmogorov-Smirnov test for samples of 30 participants, and the Shapiro-Wilk test for samples of less than 30 participants. A two-factor analysis of variance (sport type and time) with repeated measures on the second factor was used to compare athletes from different sports in pre- and post-confinement times. Bonferroni's post-hoc test was used to identify the differences between sport types and times. To compare an absolute and percentage change in body mass throughout quarantine, a one-way analysis of variance (sport type) with Tukey's post hoc was used to identify differences between sport types. The effect size was calculated using Cohen's "d" as proposed by Rhea (15): < 0.25 [trivial]; 0.25 to 0.50 [small]; 0.50 to 1.0 [moderate]; > 1.0 [large]. In addition, linear regression was used to test whether the number of quarantine days was related to increases in body mass. For all cases, a significance value of p < 0.05 was established.

**RESULTS**

There were effects of sport type ( $F_{6,227} = 5.69, p < 0.001, \eta^2_p = 0.131$ ) and time ( $F_{1,227} = 34.03, p < 0.001, \eta^2_p = 0.130$ ) on body mass (Table II). Specifically, BJJ athletes were heavier than boxers ( $p = 0.003, d = 1.27$ ), KB & MT ( $p = 0.050, d = 1.31$ ), and TKD ( $p = 0.018, d = 1.23$ ) athletes. Boxers were lighter than judo athletes ( $p < 0.001, d = -1.53$ ) and judo athletes were heavier than taekwondo athletes ( $p = 0.024, d = 0.787$ ). Absolute ( $F_{6,227} = 1.85, p = 0.091, \eta^2_p = 0.047$ ) and relative ( $F_{6,227} = 2.13, p = 0.051, \eta^2_p = 0.053$ ) body mass did not differ between combat sports. Athletes from all combat sports were heavier during quarantine when compared to pre-quarantine ( $p < 0.001, d = 0.12$ ).

No significant relationship was found between number of days in quarantine and absolute body mass and body mass percentage increases.

**DISCUSSION**

This is the first study to examine differences in body mass among combat sports athletes before and during quarantine. As expected, athletes had increased body mass during the quarantine period. These results suggest that training and nutritional strategies should be incorporated for athletes to perform at home during periods of quarantine.

Normally, combat sports athletes train with a body mass higher than the upper limit of their weight category (6). This means that many athletes have to rapidly reduce body mass (2-5) before the official weigh-in, and then rapidly regain their body mass (6-12). Due to the serious health problems that are associated with these variations in body mass (13), some federations have taken measures to modify weighing regulations. For example, in judo and taekwondo, athletes attend the official weigh-in one day before the competition but may

**Table II.** Body mass changes among combat sports athletes during the COVID-19 quarantine

Group	Body mass pre-quarantine (kg)	Body mass during quarantine (kg)	Difference in body mass (kg)	Difference in body mass (%)
BJJ	88.3 ± 10.9	90.8 ± 10.9	2.5 ± 2.2	3 ± 3
Boxing	71.4 ± 12.6 <sup>a</sup>	73.8 ± 14.0 <sup>a</sup>	2.5 ± 3.9	3 ± 5
Judo	83.1 ± 17.1 <sup>b</sup>	84.4 ± 17.6 <sup>b</sup>	1.3 ± 3.1	2 ± 4
Karate	74.4 ± 9.9	74.6 ± 10.0	0.2 ± 1.7	0 ± 2
KB & MT	75.2 ± 10.2 <sup>a</sup>	77.2 ± 10.1 <sup>a</sup>	2.1 ± 2.4	3 ± 3
MMA	77.4 ± 8.6	78.1 ± 8.3	0.7 ± 3.4	1 ± 4
TKD	73.0 ± 13.0 <sup>a,c</sup>	74.3 ± 13.1 <sup>a,c</sup>	1.3 ± 2.4	2 ± 3
Total	77.0 ± 14.2	78.7 ± 14.6 <sup>d</sup>	1.7 ± 3.0	2 ± 4

BJJ: Brazilian jiu-jitsu; MMA: mixed martial arts; TKD: taekwondo; KB & MT: kick boxing and muay-thai. a: different from BJJ; b: different from boxing; c: different from judo; d: different from pre-quarantine body mass.

be randomly selected for a new weigh-in on the competition day. If athletes randomly selected for this weigh-in exceed the body mass for their division by more than 5 %, they are disqualified. Conversely, the United World Wrestling recently modified the official weigh-in from the day before the competition to the day of the competition, approximately 2 hours before entering the first match.

Considering that it is normal practice for athletes to use rapid weight loss procedures (2-5) and train with a body mass greater than that of the competition (6), the increase in body mass reported in this study may generate greater difficulties in joining the competition circuit after quarantine. For example, an athlete who competed in the 61 kg category but trains 5 % over the division would normally weigh 64 kg. With the added 2 kg reported in this study, the athlete would reach 66 kg, corresponding to 8 % over his competition division. This difference could increase unhealthy behaviors such as spitting and vomiting, among others (3), to quickly readjust the body mass used for training and/or competition.

Our study can serve to encourage sports and nutrition professionals to develop training strategies (16) and specific diets, respectively, for quarantine to maintain the physical condition and body mass of these athletes.

In conclusion, combat sports athletes have experienced an increased body mass during the COVID-19 quarantine. Therefore, it is necessary to carry out training and nutritional strategies that seek to reduce the effect of confinement on body mass.

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