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# **Sex and weight category differences in the temporal combat structure of judokas with visual impairment**

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## **Sex and weight category differences in the temporal combat structure of judokas with visual impairment**

The study of the temporal judo combat structure of athletes with visual impairment (VI) needs further research. The objectives of the study were to determine the temporal structure of combat of judo in men and women with VI and establish differences between sexes, within their respective weight categories and between the different minutes of combat. The sample was formed by all the judokas with VI who participated in the 2018 IBSA Judo World Championship (172 men and 95 women). Through observational methodology, we analyzed all the combats ( $n = 365$ ). In order to obtain the results, we used different analytical techniques: descriptive, one-way ANOVA, t-test to show independents, chi-square, effect size and T-Patterns analysis. The level of significance was  $p \leq .05$ . The results define a temporal structure by sex and by weight category that allows the judo professionals to plan precise and adequate trainings for the athletes. We conclude that there are differences in the temporal structure of judo combat within the men and women with VI, within their respective weight categories and within the different minutes of combat. The temporal structure of combat has changed more markedly in women and unevenly in the different weight categories for both sexes.

**Key words:** judo; time-motion; temporal structure; visual impairment; sex differences

## 1. Introduction

The effort made by athletes in a judo match is intermittent. In this sport, there are no breaks with a specific duration established by the regulations (International Judo Federation, 2020), but there are breaks where the duration is changing. The number of pauses and their duration during a judo combat is indeterminate and is conditioned by the technical-tactical actions carried out by the judoka. Given this uncertainty, it is necessary to study this aspect, so it is crucial to investigate the temporal structure of combat, since it conditions the effort to be made and determines the training load. Therefore, this type of research has been developed by a large number of researchers (Challis & Maturana-Dos-Santos, 2018; Franchini et al., 2013). Despite the efforts made, the scientific community has focused its research mostly on the able-sighted judokas, and there are still insufficient studies that focus their attention on judoka with visual impairment (VI) (Gutiérrez-Santiago et al., 2011). The importance of studying this population is determined by the fact that these athletes, once the fight is stopped, spend more time to return to the starting point and to perform the regulatory grip. These circumstances entail that the pause time is longer and, therefore, alter the temporal structure of the combat. All this implies that the training load to be used with athletes with VI also has to be different (Gutiérrez-Santiago et al., 2011).

The technical-tactical differences between men and women in judo combat has been evidenced in able-sighted athletes (Miarka et al., 2020; Sterkowicz-Przybycien et al., 2017) and in athletes with VI (Gutiérrez-Santiago et al., 2011). The problem is that the results observed in judokas with VI have become obsolete due to the numerous modifications that the judo regulations have undergone (Samuel et al., 2020). These changes modify the temporal structure of combat: 1) reducing the combat time to give priority to attacks and the use of *ippon* (Miarka, Brito, et al., 2018), making that the

combats were more dynamic (Calmet et al., 2017); and 2) lowering pause times (Miyake et al., 2014). The study of the consequences of these changes has been found in able-sighted judokas (Calmet et al., 2017), showing changes in the temporal structure of combat (Challis & Maturana-Dos-Santos, 2018). The changes that the temporal structure of judo in women with VI have undergone have been recently studied (Gutiérrez-Santiago, Gutiérrez, et al., 2020), but men with VI still have not been studied, nor have the differences between both sexes been established, making it a deficiency yet to be solved.

In order to resolve these deficiencies, the objectives of the research were to determine a temporal structure of judo combat in men and women with VI, establish possible differences between both sexes, between their respective weight categories, between the minutes of the combat and discuss the changes that the said temporal structure has undergone. The results of this study make it possible for the judo trainers to establish individualized training loads for the athletes.

## **2. Method**

### ***2.1. Design***

Observational study was used to detect the pattern of the temporal structure in judo combats in men and women with VI who participated in the 2018 IBSA Judo World Championships. Because of this, we used observational methodology (Anguera et al., 2018).

The observational design (Anguera et al., 2011) used is nomothetic (all the combats), follow-up (the behaviors present in the judo combat throughout the championship are analyzed), and multidimensional (there is concurrence of behaviors).

From this design, a series of decisions about the participants, the observation and recording instruments and the analysis procedure are derived.

## **2.2. Participants**

The participants were all judokas with VI who competed in the 2018 IBSA Judo World Championship held in Odivelas-Lisbon (Portugal) (n = 267, 172 men and 95 women from the senior category). The study followed the ethical principles of the Declaration of Helsinki. Permission for carrying out the investigation was obtained by the IBSA. The study was approved by the Ethics Committee of the Faculty of Education and Sport Science (University of Vigo, Application 01/1019).

## **2.3. Instruments**

The observation instrument used in this study has been validated and used in recent investigations (Gutiérrez-Santiago, Gutiérrez, et al., 2020). This instrument is based on the *Observed Temporal System for Judo Combat -OTSJUDO-* (Gutiérrez-Santiago et al., 2011). Its complete description appears in Table 1.

The data was recorded with LINCE v.1.4 software (Gabin et al., 2012).

\*\*\*Table 1 near here\*\*\*

## **2.4. Procedure**

The combats were recorded with three SONY HDR-PJ410 cameras where the competition took place. Following the indications of other studies (Miarka, Dal Bello, et al., 2018), each camera was used to record videos in a single combat area, in order to guarantee ecological validity.

Two expert observers analyzed the combats with LINCE software after proper training. The quality of the recorded data was achieved by calculating intra- and interobserver agreement using Cohen's Kappa coefficient (Cohen, 1968) in all the categorical variables of the observation instrument. Intra-observer agreement was previously performed with combats not belonging to the final sample, in a number equivalent to one third of the final sample ( $n = 121$ ), obtaining a kappa value of 0.90 in observer 1 and 0.88 in observer 2. Subsequently, the interobserver agreement was calculated, obtaining a kappa value of 0.85. In all cases, the strength of the agreement was "almost perfect" (Landis & Koch, 1977).

After recording all the combats, we obtained an Excel file with the sequentiality of the behaviors and their duration expressed in frames. The versatility of this file allowed us to carry out successive transformations for the different analyzes (Gutiérrez-Santiago et al., 2011).

## **2.5. Data analysis**

All of the statistical analysis was done by using IBM- Statistical Package for the Social Sciences, version 20.0 (IBM-SPSS Inc., Chicago, IL, USA). A general descriptive analysis was carried out, another stratified by weight categories, and another stratified according to the minutes of the combat (Challis & Maturana-Dos-Santos, 2018; Franchini et al., 2019) of each of the variables under study through measures of central tendency (mean, standard deviation and 95% confidence intervals). The Kolmogorov-Smirnov test confirmed the normality of the sample. To detect differences between the weight categories, the mean values of the sequential and temporal parameters of the judo combats were compared with one-way ANOVA, applying a post hoc Tukey-b test

in the case that there were significant statistical differences. The comparison of the mean values between men and women was done with a t-test for independent samples.

The chi-square test was used to compare the combats that use the total combat time and those that do not, and to establish the differences between men and women in that comparison and the moment that ends the combat (1st minute, 2nd minute, etc.).

All the statistical tests were considered to have a level of significance of  $p < 0.05$ . Additionally, we analyzed the effect size through Cohen's  $d$  (Cohen, 1988) to determine the intensity of the differences found.

In order to determine the exact sequentiality of the sequential parameters of the combats, a T-Patterns analysis with Theme v.5.0. (Magnusson et al., 2016) was done with a level of significance of 0.005. This software reveals hidden structures and unobservable aspects of the behaviors (Casarrubea et al., 2018), being extremely effective in sports science (Gutiérrez-Santiago, Pereira-Rodríguez, et al., 2020; Prieto-Lage et al., 2020).

### **3. Results**

#### ***3.1. General analysis and by weight category***

All of the combats were analyzed ( $n = 365$ , 232 men and 133 women), with the following being their weight category distribution: men ( $n = 38$  in -60 kg,  $n = 40$  in -66 kg,  $n = 41$  in -73 kg,  $n = 34$  in -81 kg,  $n = 29$  in -90 kg,  $n = 27$  in -100 kg and  $n = 23$  in +100 kg) and women ( $n = 24$  in -48 kg,  $n = 19$  in -52 kg,  $n = 23$  in -57 kg,  $n = 22$  in -63 kg,  $n = 21$  in -70 kg and  $n = 24$  in +70 kg).

Table 2 shows the sequential and temporal parameters of the combats of men's judo (from a general point of view and by weight categories). The comparison of these



variables between the distinct weight categories shows that significant statistical differences were found ( $p < .05$ ) in the total time spent on the ground, the number of total ground sequences, the time of the standing sequence, the time of the pause sequence and the time of displacement and gripping in the previously stated pause sequence.

\*\*\*Table 2 near here\*\*\*

In the men's category, the pause time is longer than the fight time in all of the weight categories. They use the pause time to return to the place they were at the beginning (41.87%), to already grip the opponent prior to restarting the combat (38.44%), and to a lesser extent for other aspects such as imposing a sanction, consult the arbitration video, tie their belt or receive medical attention (19.69%), these proportions being similar between the different weight categories.

Table 3 shows the sequential and temporal parameters of the women's judo combats (from a general point of view and by weight category). The comparison of these variables between the different weight categories shows that significant statistical differences were found in the total standing fight time, the total fight time while on the ground, the total time of the fight, the number of total standing sequences and the time of the sequence of the fight while standing.

\*\*\*Table 3 near here\*\*\*

In women, the pause time is greater than the fight time in all the weight categories (except -70 kg). Additionally, the women use the pause time to return to the place at the start of the combat (44.03%), to already grip the opponent prior to restarting

the fight (38.95%), and to a lesser extent of the aspects (17.02%), these proportions being similar between the different weight categories.

The comparison between men and women of the temporal and sequential parameters of the combat is shown in Table 4. If we do not differentiate by weight categories, there are multiple differences between both sexes. Specifically, in 11 of the 17 parameters analyzed, there are significant differences ( $p < .05$ ), even though the effect size indicates that they are minor. If we differentiate by weight category, we observe that the differences between men and women reduce substantially. There are only differences in a few temporal parameters between the categories -73 vs. -57 kg and -90 vs. -70 kg. In addition, the effect size reveals that the aforementioned differences are minor or moderate.

\*\*\*Table 4 near here\*\*\*

### **3.2. *General analysis in the exact minutes of combat***

In the men and women, respectively, 32.8-36.8% ( $n = 76-49$ ) of the combats finish in the first minute, 25.4-27.1% ( $n = 59-36$ ) during the second minute, 16.4-18% ( $n = 38-24$ ) during the third minute, 18.5-15% ( $n = 43-20$ ) during the last minute and solely 6.9-3% ( $n = 16-4$ ) compete in the golden score. There are not any significant differences between both sexes ( $\chi^2 = 3.569$ ;  $p = .467$ ).

In the men's category, 84.5% ( $n = 196$ ) of the combats finished before using up the entire maximum regulated time and only 15.5% ( $n = 36$ ) used up that time, with there being significant differences in both situations ( $\chi^2 = 110.345$ ;  $p < .001$ ). In the women's category, 89.5% ( $n = 119$ ) of the combats finish before using up the entire maximum regulated time, and only 10.5% ( $n = 14$ ) used the entire time, with there

being significant differences in both situations ( $\chi^2 = 82.895$ ;  $p < .001$ ). By comparing these situations of the combat between both sexes, we observed that there are not any differences between men and women ( $\chi^2 = 1.781$ ;  $p = .182$ ).

Knowing that only some combats use the maximum time established by the regulations and that not all the combats finish in the same minute, we consider it necessary to analyze the temporal and sequential parameters of the combat in the distinct minutes of the combat (1<sup>st</sup> minute, 2<sup>nd</sup> minute, 3<sup>rd</sup> minute, 4<sup>th</sup> minute and the golden score). Table 5 shows this analysis in men and in women.

\*\*\*Table 5 near here\*\*\*

In the first analysis, we have included the golden score (ANOVA with GS). The comparison of the minutes in this first analysis is conditioned by the temporal and sequential parameters of the golden score, in such a way that there are significant differences in up to 12 of the 16 parameters. Thus, the Tukey b test indicates that generally the golden score shows significant differences with the rest of the minutes of the combat.

Considering that only 3-6.9% of the combats are resolved with the golden score, we conducted a second analysis excluding the golden score (ANOVA without GS). The comparison between the different minutes of the combat showed that, in both men and in women, statistically significant differences were found in the total pause time (as the combat progresses, the pauses are longer), the displacement time during the pause (as the combat progresses, the pause time is longer), the number of total sequences fighting standing, the time of a sequence fighting while standing, the time of a pause sequence and the displacement time in a pause sequence. The total time fighting while standing

only showed significant differences in men (as the fight progresses, they fight less time standing).

Table 6 compares the temporal and sequential parameters of the combat between men and women in the different minutes of combat. In the first minute of combat, there are significant differences in the total time fighting while standing and in the time of the sequence of fighting while standing (both cases being higher in men). In the second minute of combat, the differences are in the total time fighting while standing (higher in men), and in the total fighting time on the ground and in the time of the fighting sequence on the ground (both cases being higher in women). In the third minute, there are not any differences between sexes. In the fourth minute, the only differences are in the total fighting time while standing (being higher in men). The only differences in the golden score are in the time dedicated to gripping during a pause sequence (being clearly higher in women).

\*\*\*Table 6 near here\*\*\*

### **3.3. *T-Patterns Analysis***

The T-Patterns analysis indicates the exact distribution of the sequences of the fight (standing and on the ground) and of the pause sequences. Figure 1 shows this distribution in the different weight categories in men and in Figure 2 in women.

\*\*\*Figure 1 and 2 near here\*\*\*

## **4. Discussion**

#### **4.1. Changes in the temporal structure of combat in judokas with VI**

##### *4.1.1. Differences between both sexes*

Currently, 84.5% (men) and 89.5% (women) of the combats finish before using the maximum regulated time, without there being any significant differences between sexes. This is an aspect that has increased in both cases, since previous studies reflect 81% and 74%, respectively (Gutiérrez-Santiago et al., 2011). Probably, regulation changes made it so that the combats were more dynamic (Calmet et al., 2017), giving priority to the attacks and using *ippon* (Miarka, Brito, et al., 2018), achieving the highest number of combats to end before reaching the maximum regulated time.

When we compare the temporal parameters between men and women on a global scale (without differentiating weight categories), we observe significant differences in eleven variables. The men's data is higher than the women's in "Total Combat Time", "Total Standing Time", "Total Pause Time", "Total Pause Gripping Time", "Total Other Pause Time", "Total Standing Sequences", "Total Pause Sequences", "Standing Sequence Time", "Pause Sequence Time" and "Pause-Grip Sequence Time". The "Ground Sequence Time" is higher in women than in men. In a previous study (Gutiérrez-Santiago et al., 2011), of the thirteen variables that were analyzed, there were only three significant differences (Total Standing Time, Standing Sequence Time and Total Ground Time). That time was higher in the men in the first two categories and higher in the women in the last category. This situation allowed us to affirm that the time spent fighting on the ground has now been equalized.

The effect size test revealed that all previous differences are small. For this reason, we consider it necessary to carry out the comparisons between the men and women's weight categories. This way, the differences between men and women would

reduce considerably. The differences ceased to exist when comparing -60 vs. -48 kg (extra-lightweight), -66 vs. -52 kg (half-lightweight), -81 vs. -63 kg (half-middleweight) and -100 vs. +70 kg (half-heavyweight male vs. heavyweight female). In the comparison between -73 vs. -57 kg (lightweight), the men's data was higher than the women's in "Total Combat Time", "Total Standing Time", "Total Fight Time" and "Standing Sequence Time". This data allows us to show that the effort used by men is greater than that of the women. This tendency has already been observed in able-sighted judokas (Sterkowicz-Przybycien et al., 2017). In the comparison between -90 vs. -70 kg (middleweight), men's data were lower than the women's in "Total Ground Time" and "Ground Sequence Time". This was a tendency was also observed in able-sighted judokas (Sterkowicz-Przybycien et al., 2017).

#### *4.1.2. Differences between weight categories*

In the women in the variable "Total Standing Time", the -57 kg category presents differences to the other weight categories, making it the category that uses less time fighting while standing (41 seconds).

Regarding the variable "Total Ground Time", in the men, the -81 kg category clearly dedicates less time fighting on the ground (26 seconds). This is an aspect that has changed in regards to a previous study, where the category that used less time (27 seconds) was the +100 kg category (Gutiérrez-Santiago et al., 2013). In women, the +70 kg category used less time fighting on the ground (27 seconds), and the -70 kg category is that which spends more time fighting on the ground (61 seconds).

In women, in the "Total Standing Sequences" variable, the -52 kg category presents differences to the other categories, making it the category that uses the highest

number of fighting sequences while standing, which is about eight. This characteristic shows that the effort is more fractioned than the rest of the weight categories.

Regarding the “Total Ground Sequences” variable, in men, the -81 kg category is the one that performs the least sequences (2), and the -66 kg category is the one that performs the most sequences (5), both categories showing differences with respect to the other weight categories. This aspect has partially changed with respect to a previous study where the category that performed the fewest sequences (2) was the +100 kg category, while the category that performed the most sequences (7) was also the -66 kg category (Gutiérrez-Santiago et al., 2013).

In both men and women, it is observed that in the variable “Standing Sequence Time,” the weight categories (+100 kg in men and -70 and +70 kg in women) use more time than the rest of the weight categories. This is a characteristic of those that were weighed. This aspect was already observed in the men in a previous study (Gutiérrez-Santiago et al., 2013).

The +100 kg category has a distinct behavior to that of the rest of the weight categories regarding the pauses in combat. This category is the one that has less pause sequences performed in the combat (4). In a previous study (Gutiérrez-Santiago et al., 2013), this weight category was also that which performed the least pause sequences (2). For this reason, it is the category that has the longest duration of pause sequences (30 seconds), lengthening both the time dedicated to returning to the starting place and the time dedicated to performing the regulated grip. It is probably a strategy to recover the effort that was used. This behavior was already observed in the past in able-sighted judokas (Gorostiaga, 1988). This tendency was not observed in a previous study (Gutiérrez-Santiago et al., 2013), where the category with the longest lasting pause

sequence was from the -60 kg category (20 seconds), with the +100 kg category at 15 seconds.

#### *4.1.3. Differences between the minutes of the combat*

When we compare the different minutes, both in males and females, we can find statistically significant differences in the temporal parameters that are related to the pause time (total pause time, displacement time during the pause, time of a pause sequence and displacement time in a pause sequence). In any case, as the combat progresses, the pauses are longer. Without a doubt, this circumstance explains the accumulated fatigue in the last minutes of the combat. They probably take longer in returning to the beginning place as a recovery strategy. This strategy was observed in judokas with sight, resorting to placing the judogi, the waist as a way to gain recovery time (Gorostiaga, 1988). This circumstance was solved with the changes undergone in the regulation in this way (International Judo Federation, 2020). We consider that this aspect could hardly be solved in judokas with DV, because any delay could be attributed to their degree of visual impairment.

#### *4.1.4. Changes in temporal structure (1998 vs. 2018)*

In order to determine the changes in the temporal structure, we compared our results (2018 World Championship) with the results of the 1998 World Championship (Gutiérrez-Santiago et al., 2011, 2012, 2013; Gutiérrez Santiago, 2005). The comparison was made with the necessary scientific rigor, using the effect size to determine the intensity of the differences. In Table 7 these differences can be clearly seen.

\*\*\*Table 7 near here\*\*\*



The global parameters of combat show important changes with respect to previous studies. Previously, significant differences between sexes were only in the total time fighting while standing and on the ground, and in the time of the standing fight sequence (Gutiérrez-Santiago et al., 2011). Currently, the differences in the total time fighting on the ground disappear, as men and women fight almost the same time (44 s and 47 s, respectively). Likewise, this time has been drastically reduced compared to previous studies where men fought for 60 s and women 84 s (Gutiérrez-Santiago et al., 2011). In addition, there are currently differences between both sexes in other parameters in which these differences did not previously occur, such as: the total time of the combat, the total pause time, the number of total standing and pause sequences, and the time of a pause and ground fight sequence. All these variables are longer in males, except for the ground fight sequence time that is higher in women, which is probably due to a partiality in females in these technical-tactical fight situations on the ground, which they do not mind passing more time fighting on the ground. In able-sighted judokas, when the match is tied, transitions from ground combat occurred more frequently in the senior female group than males (Nagai et al., 2019).

When we compare our data with that of previous studies (Gutiérrez-Santiago et al., 2011) we observe that all of the sequential parameters have been reduced a sequence in both sexes. In the total combat time, the total pause time and the total fight time in men is practically the same as other studies (Gutiérrez-Santiago et al., 2011, 2012). On the contrary, the total combat time in women has been reduced by more than half a minute, and the total pause time by almost one minute. Regarding the total pause time, we have to point out that the changes the regulation has undergone in recent decades (Samuel et al., 2020) reduced the pause time in able-sighted judokas (Miyake et al., 2014). Our results show that this decrease has also occurred in the case of women, but

not in the men (remaining practically the same). Despite this reduction, the pause time for VI judokas is still much longer today compared to able-sighted judokas (Franchini et al., 2019; Miarka et al., 2014; Miyake et al., 2014; Sterkowicz-Przybycien et al., 2017), which confirms and maintains previous findings (Gutiérrez-Santiago et al., 2011). Finally, it should be noted that the time of a standing fight sequence has undergone a considerable increase compared to previous studies (Gutiérrez-Santiago et al., 2011), increasing by five/six seconds in men/women.

The explanation for all these changes resides in the numerous modifications of the regulation of judo. In 1997, combat duration used to be five minutes for males and four for females. In 2003, it was modified by being five minutes for both. This was the situation for 11 years, when the values from 1997 were recovered in 2014. In 2014, the penalty in the place where the competitor is (without the need to return to the starting position of the fight) was decided, in order to reduce pause times, a reduction that was even obtained previously thanks to the changes mentioned in the regulations of the International Judo Federation, as shown by different authors (Miyake et al., 2014). In 2017, the modified again the combat time by equating it for both sexes to be four minutes. These modifications were done so that the combats could be more dynamic (Calmet et al., 2017), giving priority to the attacks and using *ippon* (Miarka, Brito, et al., 2018), which are aspects that have interfered in the temporal structure of combat, reducing the time of combat in able-sighted judokas, and that in the same way has affected the fighting of the visual impairment judokas.

A limitation of this study was not being able to compare the -63 kg women judokas with VI category because there are not any previous investigations about it.

#### **4.2. *Practical Applications***

In this study, we have evidenced differences between men and women, and between their respective weight categories in the temporal and sequential parameters of combat. Therefore, the results of this study cannot be generalized. They must be individualized by sex and by weight category. With the results, we have defined a temporal structure “type” (Table 8) of a judo combat in men and women with VI for each weight category. The professionals of sports performance may elaborate, based on them, accurate and appropriate training for athletes.

\*\*\*Table 8 near here\*\*\*

#### **5. Conclusions**

There are significant differences between men and women, between their respective weight categories, and between the different minutes of combat in the temporal structure of combat.

There are clear changes in the temporal and sequential structure of combat, being more accentuated in women than in men, and unevenly in the different weight categories in both sexes.

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#### **7. Disclosure statement**

The authors report no conflict of interest.

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## Tables

**Table 1.** Observational Instrument.

Criteria	Category	Code	Description
Weight Category	Men	Women	M W
	60	48	60 48
	66	52	66 52
	73	57	73 57
	81	63	81 63
	90	70	90 70
	100	+70	100 M70
	+100	M100	
Moment in the Combat	1st minute	1m	Between 0'' and 60''
	2nd minute	2m	Between 61'' and 120''
	3rd minute	3m	Between 121'' and 180''
	4th minute	4m	Between 181'' and 240''
	Golden Score	GS	Golden Score – Extra Time
STANDING Fight Sequences	1st standing sequence	STD1	1 <sup>st</sup> sequence of a standing fight
	2nd standing sequence	STD2	2 <sup>nd</sup> sequence of a standing fight
	3rd standing sequence	STD3	3 <sup>rd</sup> sequence of a standing fight
	4th standing sequence	STD4	4 <sup>th</sup> sequence of a standing fight
	Remaining standing sequence	etc.	Until the maximum sequences occur
PAUSE Sequence	1st pause sequence	PA1	1st pause sequence
	2nd pause sequence	PA2	2nd pause sequence
	3rd pause sequence	PA3	3rd pause sequence
	Remaining pause sequence	etc.	Until the maximum sequences occur
Movements during the pause	Displacement	DISPL.	Time spent searching for judoka to take it to the starting position and/or moving to the starting position.
	Grip	GRIP	Time spent from the starting position and gripping until the referee declares <i>hajime</i> after a pause.
	Other	OTHER	Time spent on other situations: belt tying, penalties, video checking, etc.
GROUND Fight Sequence	1st ground sequence	GND1	1st ground fight sequence
	2nd ground sequence	GND2	2 <sup>nd</sup> ground fight sequence
	3rd ground sequence	GND3	3 <sup>rd</sup> ground fight sequence
	Remaining ground sequence	Etc.	Until the maximum sequences occur

**Table 2.** Descriptive Analysis (general combat –total- and by weight categories), ANOVA and degree of significance of the sequential and temporary parameters of judo combat of men with VI.

Category	Total (n=232)	-60 kg (n=38)	-66 kg (n=40)	-73 kg (n=41)	-81 kg (n=34)	-90 kg (n=29)	-100 kg (n=27)	+100 kg (n=23)	ANOVA		
	Mean±sd (95% CI) (s)	Mean±sd (95% CI) (s)	Mean±sd (95% CI) (s)	Mean±sd (95% CI) (s)	Mean±sd (95% CI) (s)	Mean±sd (95% CI) (s)	Mean±sd (95% CI) (s)	Mean±sd (95% CI) (s)	F	g/l	Sig
Total Combat Time (TCT)	257.67±226.27 (228.40-286.94)	247.66±182.92 (187.53-307.78)	288.53±241.61 (211.26-365.79)	279.63±263.80 (196.37-362.90)	251.97±210.81 (178.42-325.52)	228.83±190.91 (156.21-301.45)	253.89±276.87 (144.36-363.42)	230.65±207.16 (141.07-320.23)	.333	6	.919
Total Standing Time (TSTDT)	90.44±70.79 (81.28-99.59)	74.42±53.77 (56.75-92.10)	108.50±70.82 (85.85-131.15)	86.20±81.30 (60.53-111.86)	86.29±64.12 (63.92-108.67)	93.10±64.44 (68.59-117.62)	88.11±83.04 (55.26-120.96)	98.52±77.83 (64.87-132.18)	.861	6	.524
Total Ground Time (TGNDT)	43.82±38.39 (38.19-49.45)	53.81±43.03 (38.30-69.33)	55.81±49.75 (37.56-74.06)	47.24±33.70 (36.01-58.48)	26.00±27.30 (15.20-36.80)	34.86±30.26 (21.08-48.63)	46.82±42.21 (25.12-68.53)	31.31±19.14 (21.12-41.51)	2.493	6	<b>.024</b>
Total Fight Time (TFT)	124.62±91.96 (112.72-136.52)	119.74±76.27 (94.67-144.81)	151.75±103.47 (118.66-184.84)	128.83±97.32 (98.11-159.55)	106.94±75.99 (80.43-133.46)	118.34±83.56 (86.56-150.13)	117.59±113.58 (72.66-162.52)	120.30±89.43 (81.63-158.98)	.876	6	.513
Total Pause Time (TPAT)	157.06±141.89 (137.12-177.00)	143.15±110.41 (104.62-181.67)	171.13±144.87 (118.90-223.35)	167.11±174.47 (108.94-225.28)	149.52±144.55 (98.26-200.77)	145.73±109.94 (96.98-194.47)	184.45±172.80 (103.58-265.32)	136.11±120.89 (77.84-194.37)	.363	6	.902
Total Pause Displacement Time (TPADT)	69.67±63.12 (60.80-78.54)	61.18±45.81 (45.19-77.16)	85.47±74.26 (58.70-112.24)	75.22±71.63 (51.33-99.10)	63.76±65.69 (40.47-87.05)	63.09±49.67 (41.07-85.12)	75.10±72.18 (41.32-108.88)	59.63±53.19 (34.00-85.27)	.670	6	.674
Total Pause Gripping Time (TPAGT)	63.97±57.25 (55.93-72.01)	58.15±44.13 (42.75-73.54)	68.53±63.60 (45.60-91.46)	64.70±55.05 (46.35-83.06)	66.58±69.43 (41.96-91.19)	63.77±53.99 (39.83-87.71)	62.70±54.10 (37.38-88.02)	62.32±62.51 (32.19-92.44)	.106	6	.996
Total Other Pause Time (TOPAT)	32.77±47.86 (24.71-40.82)	33.00±35.39 (18.39-47.61)	17.54±18.88 (9.91-25.17)	46.09±70.37 (14.89-77.29)	31.80±28.08 (18.66-44.94)	22.89±22.38 (11.76-34.02)	64.79±93.87 (10.58-118.99)	20.92±20.25 (8.69-33.16)	2.129	6	.054
Total Standing Sequences (TSTDS)	6.09±4.93 (5.46-6.73)	5.97±4.31 (4.56-7.39)	7.33±5.72 (5.50-9.15)	7.12±5.91 (5.26-8.99)	6.09±4.45 (4.53-7.64)	5.21±4.18 (3.62-6.80)	5.19±4.86 (3.26-7.11)	4.52±3.60 (2.96-6.08)	1.433	6	.203
Total Ground Sequences (TGND S)	3.78±2.98 (3.34-4.22)	4.44±3.28 (3.25-5.62)	5.03±3.67 (3.68-6.38)	3.86±2.76 (2.94-4.79)	2.37±1.74 (1.68-3.06)	3.24±2.74 (1.99-4.48)	4.00±3.12 (2.39-5.61)	2.69±1.96 (1.64-3.73)	2.840	6	<b>.012<sup>ab</sup></b>
Total Pause Sequences (TPAS)	6.12±4.95 (5.43-6.82)	5.56±4.16 (4.11-7.01)	7.97±5.49 (5.99-9.95)	6.89±5.97 (4.90-8.88)	5.42±4.56 (3.81-7.04)	5.68±4.11 (3.86-7.50)	5.95±5.19 (3.52-8.38)	4.42±3.79 (2.59-6.25)	1.507	6	.178
Standing Sequence Time (STDST)	16.51±9.66 (15.26-17.76)	14.38±10.90 (10.80-17.96)	18.10±12.95 (13.95-22.24)	12.43±6.47 (10.38-14.47)	15.21±7.17 (12.70-17.71)	19.07±7.64 (16.16-21.98)	17.40±7.73 (14.34-20.46)	22.18±9.73 (17.97-26.39)	3.763	6	<b>.001<sup>cd</sup></b>
Ground Sequence Time (GNDST)	12.01±6.47 (11.07-12.96)	12.36±6.8 (9.90-14.82)	11.96±8.40 (8.88-15.04)	13.24±5.55 (11.39-15.10)	9.71±5.85 (7.40-12.02)	11.63±5.86 (8.96-14.30)	11.40±5.00 (8.83-13.97)	13.62±6.43 (10.20-17.05)	1.014	6	.418
Pause Sequence Time (PAST)	25.21±8.92 (23.96-26.46)	26.40±9.34 (23.14-29.66)	20.44±4.98 (18.64-22.24)	23.02±7.85 (20.40-25.64)	25.96±9.48 (22.60-29.32)	25.32±8.08 (21.74-28.90)	28.78±12.67 (22.86-34.71)	30.22±6.28 (27.19-33.24)	3.891	6	<b>.001<sup>efg</sup></b>
Pause-Displacement Sequence Time (PADST)	10.94±3.22 (10.49-11.39)	11.15±2.88 (10.15-12.16)	9.62±3.23 (8.46-10.79)	10.55±2.60 (9.68-11.42)	10.91±3.21 (9.78-12.05)	10.58±3.07 (9.22-11.94)	11.77±3.12 (10.31-13.23)	13.12±4.16 (11.11-15.13)	2.881	6	<b>.010<sup>h</sup></b>
Pause-Grip Sequence Time (PAGST)	10.93±4.92 (10.23-11.62)	11.42±4.97 (9.68-13.15)	8.70±3.39 (7.48-9.92)	10.12±5.32 (8.35-11.90)	11.45±4.97 (9.68-13.21)	11.40±5.04 (9.16-13.63)	10.63±3.97 (8.77-12.49)	14.21±5.40 (11.61-16.81)	3.002	6	<b>.008<sup>g</sup></b>
Pause-Other Sequence Time (PAOST)	4.78±5.98 (3.77-5.79)	5.37±4.83 (3.38-7.37)	2.68±3.04 (1.46-3.91)	4.10±2.88 (2.82-5.38)	5.92±8.46 (1.96-9.88)	3.97±4.10 (1.93-6.01)	8.59±11.80 (1.77-15.40)	4.24±2.78 (2.56-5.92)	1.825	6	.099

The significant differences (p<0.05) are shown in bold. CI=confidence intervals. <sup>a</sup>-66 kg present significant differences to the remaining categories. <sup>b</sup>-81 kg show significant differences to the other categories. <sup>c</sup>+100 kg present significant differences to the remaining categories. <sup>d</sup>-60, -73 y -81 kg show significant differences to the other categories. <sup>e</sup>-100 y +100 kg present significant differences to the remaining categories. <sup>f</sup>-66 y +100 kg show significant differences to the other categories. <sup>g</sup>-66 y -73 kg present significant differences to the remaining categories. <sup>h</sup>-66, -73 y -90 kg show significant differences to the other categories.



**Table 3.** Descriptive Analysis (general combat –total- and by weight categories), ANOVA and degree of significance of the sequential and temporary parameters of judo combat of women with VI.

Category	Total (n=133)	-48 kg (n=24)	-52 kg (n=19)	-57 kg (n=23)	-63 kg (n=22)	-70 kg (n=21)	+70 kg (n=24)	ANOVA		
	Mean±sd (95% CI) (s)	Mean±sd (95% CI) (s)	Mean±sd (95% CI) (s)	Mean±sd (95% CI) (s)	Mean±sd (95% CI) (s)	Mean±sd (95% CI) (s)	Mean±sd (95% CI) (s)	F	g/l	Sig
<b>Total Combat Time</b>	208.31±178.83 (177.63-238.98)	226.50±177.52 (151.54-301.46)	279.95±211.52 (178.00-381.89)	167.52±158.67 (98.91-236.13)	167.55±201.99 (77.99-257.10)	260.00±160.31 (187.03-332.97)	164.63±145.15 (103.34-225.91)	1.819	5	.114
<b>Total Standing Time</b>	65.38±51.85 (56.49-74.28)	63.58±47.97 (43.33-83.84)	87.58±61.20 (58.08-117.08)	41.22±33.14 (26.89-55.55)	56.73±51.76 (33.78-79.68)	86.48±53.21 (62.26-110.70)	62.25±52.52 (40.07-84.43)	2.699	5	<b>.024ab</b>
<b>Total Ground Time</b>	47.03±37.78 (40.15-53.92)	56.55±43.13 (37.42-75.67)	54.44±39.28 (34.91-73.98)	43.68±35.35 (28.01-59.36)	39.59±36.74 (20.70-58.48)	61.00±40.02 (41.71-80.29)	26.65±21.58 (16.55-36.75)	2.404	5	<b>.041cd</b>
<b>Total Fight Time</b>	107.11±77.39 (93.84-120.39)	115.42±72.94 (84.62-146.22)	139.16±81.64 (99.81-178.51)	83.00±63.14 (55.70-110.30)	87.32±83.30 (50.39-124.25)	141.67±81.32 (104.65-178.68)	84.46±66.62 (56.33-112.59)	2.881	5	<b>.017</b>
<b>Total Pause Time</b>	121.38±109.12 (100.85-141.90)	133.45±109.01 (82.43-184.47)	149.33±137.09 (81.16-217.51)	97.35±104.57 (48.41-146.29)	110.19±133.20 (39.21-181.17)	124.30±88.65 (82.81-165.79)	112.94±82.74 (70.40-155.48)	.524	5	.757
<b>Total Pause Displacement Time</b>	57.29±50.58 (47.77-66.80)	64.55±48.08 (42.05-87.05)	72.67±64.06 (40.81-104.52)	46.30±49.16 (23.29-69.31)	50.75±58.27 (19.70-81.80)	58.85±44.19 (38.17-79.53)	49.71±38.97 (29.67-69.74)	.729	5	.603
<b>Total Pause Gripping Time</b>	50.68±47.43 (41.76-59.61)	51.75±42.32 (31.94-71.56)	66.67±66.33 (33.68-99.65)	38.60±41.41 (19.22-57.98)	47.13±54.63 (18.02-76.23)	51.60±40.60 (32.60-70.60)	49.00±37.22 (29.86-68.14)	.684	5	.636
<b>Total Other Pause Time</b>	22.14±23.90 (16.26-28.01)	28.73±30.44 (8.27-49.18)	13.69±10.13 (7.57-19.81)	25.00±28.81 (4.39-45.61)	25.13±31.51 (-1.22-51.47)	23.00±21.57 (9.29-36.71)	20.00±22.31 (5.82-34.18)	.548	5	.739
<b>Total Standing Sequences</b>	5.11±3.97 (4.42-5.79)	5.25±3.85 (3.63-6.87)	7.53±5.46 (4.89-10.16)	4.70±4.05 (2.94-6.45)	4.05±3.59 (2.45-5.64)	5.57±3.06 (4.18-6.96)	4.00±3.04 (2.72-5.28)	2.320	5	<b>.047ef</b>
<b>Total Ground Sequences</b>	3.57±2.89 (3.04-4.10)	3.95±3.09 (2.58-5.33)	4.50±3.52 (2.75-6.25)	3.38±3.26 (1.90-4.87)	3.18±2.81 (1.73-4.62)	3.58±2.19 (2.52-4.64)	2.85±2.30 (1.77-3.93)	.771	5	.573
<b>Total Pause Sequences</b>	5.01±3.95 (4.27-5.75)	5.15±3.67 (3.43-6.87)	6.94±5.51 (4.20-9.69)	4.35±4.25 (2.36-6.34)	4.25±3.61 (2.33-6.17)	4.95±2.96 (3.56-6.34)	4.35±2.98 (2.82-5.88)	1.207	5	.311
<b>Standing Sequence Time</b>	13.55±7.51 (12.26-14.83)	13.30±7.32 (10.21-16.39)	12.26±5.35 (9.68-14.84)	9.21±3.84 (7.56-10.87)	14.40±6.16 (11.67-17.13)	15.81±7.13 (12.56-19.06)	16.20±11.05 (11.54-20.87)	2.875	5	<b>.017bg</b>
<b>Ground Sequence Time</b>	14.35±10.20 (12.48-16.21)	14.85±7.53 (11.51-18.19)	13.32±8.35 (9.17-17.47)	16.28±18.55 (7.84-24.72)	13.19±5.27 (10.48-15.90)	17.84±7.89 (14.04-21.64)	10.34±5.42 (7.80-12.88)	1.323	5	.260
<b>Pause Sequence Time</b>	23.20±7.36 (21.81-24.58)	24.81±5.87 (22.06-27.56)	20.31±4.15 (18.25-22.38)	21.20±5.67 (18.54-23.85)	22.29±7.17 (18.47-26.11)	23.71±8.07 (19.93-27.49)	26.98±10.75 (21.45-32.50)	2.102	5	.071
<b>Pause-Displacement Sequence Time</b>	11.02±2.98 (10.46-11.58)	12.22±2.88 (10.87-13.57)	10.09±2.44 (8.88-11.31)	10.53±2.92 (9.16-11.89)	10.99±3.68 (9.03-12.95)	11.18±3.47 (9.56-12.81)	11.01±2.18 (9.88-12.13)	1.125	5	.352
<b>Pause-Grip Sequence Time</b>	9.77±3.89 (9.04-10.50)	9.67±3.66 (7.96-11.38)	8.96±2.73 (7.61-10.32)	8.67±2.25 (7.62-9.72)	9.53±3.94 (7.43-11.62)	10.31±5.20 (7.88-12.74)	11.64±4.62 (9.26-14.01)	1.372	5	.241
<b>Pause-Other Sequence Time</b>	3.83±5.25 (2.54-5.12)	4.06±3.38 (1.79-6.33)	1.73±1.00 (1.13-2.34)	3.95±4.12 (1.01-6.90)	3.68±2.65 (1.46-5.90)	3.68±3.64 (1.37-5.99)	6.04±10.43 (-0.59-12.67)	.841	5	.526

The significant differences ( $p < 0.05$ ) are shown in bold. CI=confidence intervals. <sup>a</sup>-52 y -70 kg present significant differences to the remaining categories. <sup>b</sup>-57 kg show significant differences to the other categories. <sup>c</sup>-70 kg present significant differences to the remaining categories. <sup>d</sup>+70 kg show significant differences to the other categories. <sup>e</sup>-52 kg present significant differences to the remaining categories. <sup>f</sup>-63 y +70 kg show significant differences to the other categories. <sup>g</sup>-70 y +70 kg present significant differences to the remaining categories.

**Table 4.** Comparison (general combat –total- and by weight categories) between men (M) and women (W) with VI of the sequential and temporary parameters of judo combat. Results of the effect size (Cohen’s d) in the differences found.

Category	Total (M vs W)				-60 vs.-48 kg		-66 vs.-52 kg		-73 vs.-57 kg		Cohen’s d		-81 vs.-63 kg		-90 vs.-70 kg		Cohen’s d		-100 vs.+70 kg	
	T-test		Cohen’s d		T-test		T-test		T-test		Cohen’s d		T-test		T-test		Cohen’s d		T-test	
	t	p	d	r	t	p	t	p	t	p	d	r	t	p	t	p	d	r	t	p
TCT	2.299	<b>.022</b>	0.235	0.112	.449	.655	.132	.895	2.122	<b>.038</b>	0.483	0.226	1.488	.143	-.608	.546			1.464	.151
TSTDT	3.874	<b>.000</b>	0.388	0.184	.805	.424	1.105	.274	3.111	<b>.003</b>	0.659	0.302	1.812	.075	.385	.702			1.310	.196
TGNDT	-.713	.477			-.229	.820	.099	.921	.385	.701			-1.405	.167	-2.344	<b>.024</b>	-0.742	-0.348	1.782	.088
TFT	1.939	.053			.221	.826	.465	.643	2.279	<b>.026</b>	0.528	0.246	.909	.367	-.985	.330			1.287	.205
TPAT	2.465	<b>.014</b>	0.272	0.130	.313	.755	.520	.605	1.633	.108			.915	.365	.691	.494			1.642	.112
TPADT	1.771	.078			-.257	.799	.614	.542	1.609	.113			.673	.504	.291	.772			1.358	.185
TPAGT	2.076	<b>.039</b>	0.246	0.117	.522	.604	.098	.922	1.853	.069			.981	.332	.819	.418			.908	.371
TOPAT	2.116	<b>.036</b>	0.255	0.118	.347	.731	.684	.498	.907	.371			.549	.587	-.014	.989			1.729	.105
TSTDS	2.094	<b>.037</b>	0.215	0.103	.671	.505	-.128	.898	1.749	.085			1.803	.077	-.339	.736			1.029	.309
TGNDS	.591	.555			.544	.589	.496	.622	.600	.551			-1.062	.299	-.432	.668			1.288	.206
TPAS	2.164	<b>.031</b>	0.241	0.115	.364	.717	.633	.530	1.684	.098			.902	.372	.656	.516			1.121	.270
STDST	3.257	<b>.001</b>	0.331	0.157	.428	.670	1.883	.065	2.492	<b>.015</b>	0.566	0.262	.434	.666	1.530	.133			.452	.653
GNDST	-2.417	<b>.016</b>	-0.287	-0.139	-1.261	.213	-.549	.586	-.930	.356			-1.995	.053	-2.843	<b>.007</b>	-0.900	-0.410	.613	.544
PAST	2.022	<b>.044</b>	0.240	0.114	.687	.495	.090	.929	.914	.365			1.368	.178	.645	.522			.464	.646
PADST	-.219	.827			-1.317	.194	-.535	.595	.026	.979			-.077	.939	-.596	.554			.846	.403
PAGST	2.124	<b>.034</b>	0.252	0.120	1.370	.176	-.281	.780	1.440	.156			1.350	.184	.687	.496			-.713	.481
PAOST	1.103	.271			.813	.422	1.093	.282	.118	.907			.727	.474	.202	.841			.578	.569

Abbreviations in table 2. The significant differences (p<0.05) are shown in bold. Expression of the effect size: *d* y *r*, *d*<0.2 (null), *d*=0.2-0.49 (small), *d*=0.5-0.80 (moderate) y *d*>0.8 (large).

**Table 5.** General descriptive analysis of combats during the different minutes, ANOVA (with and without GS) and the degree of significance of the sequential and temporary parameters of judo combat of men (M) and women (W) with VI.

Category	Sex	1m (n = 232 M and 133 W)	2m (n = 155 M and 84 W)	3m (n = 97 M and 48 W)	4m (n = 59 M and 24 W)	GS (n = 16 M and 4 W)	ANOVA with GS			ANOVA without GS		
		Mean±sd (95% CI) (s)	Mean±sd (95% CI) (s)	Mean±sd (95% CI) (s)	Mean±sd (95% CI) (s)	Mean±sd (95% CI) (s)	F	g/l	Sig	F	g/l	Sig
TSTDT	M	39.76±17.23 (37.53-41.99)	35.77±16.40 (33.14-38.40)	34.64±16.19 (31.32-37.95)	33.67±15.53 (29.59-37.76)	69.50±52.84 (41.35-97.65)	14.096	4	<b>.000<sup>i</sup></b>	3.804	3	<b>.010<sup>ab</sup></b>
	W	32.21±16.00 (29.47-34.95)	29.72±14.87 (26.36-33.07)	30.53±16.68 (25.40-35.67)	26.22±13.64 (20.32-32.12)	40.00±15.58 (15.21-64.79)	1.208	4	.308	1.149	3	.330
TGNDT	M	18.65±11.82 (16.78-20.53)	18.72±12.72 (16.40-21.04)	19.49±11.43 (16.94-22.03)	20.25±12.73 (16.55-23.95)	26.83±28.89 (8.47-45.19)	1.255	4	.287	.276	3	.843
	W	21.15±11.97 (18.88-23.41)	22.91±12.36 (20.08-25.73)	21.85±14.27 (17.35-26.36)	23.18±12.67 (17.56-28.80)	17.50±14.36 (-5.36-40.36)	.401	4	.808	.369	3	.775
TFT	M	52.22±15.65 (50.20-54.24)	49.33±17.18 (46.60-52.06)	49.64±17.14 (46.18-53.09)	49.58±17.20 (45.09-54.06)	89.63±64.17 (55.43-123.82)	16.304	4	<b>.000<sup>i</sup></b>	1.230	3	.298
	W	49.70±16.82 (46.81-52.58)	48.32±17.34 (44.56-52.08)	46.02±20.18 (40.16-51.88)	46.38±18.87 (38.41-54.34)	57.50±3.79 (51.48-63.52)	.739	4	.566	.631	3	.596
TPAT	M	52.21±33.04 (47.50-56.93)	64.48±43.18 (57.24-71.72)	60.82±34.59 (53.49-68.15)	73.00±35.33 (63.63-82.37)	155.44±156.00 (72.31-238.56)	20.014	4	<b>.000<sup>i</sup></b>	5.912	3	<b>.001<sup>ab</sup></b>
	W	47.41±25.24 (42.57-52.25)	57.16±31.82 (49.51-64.80)	65.74±38.45 (53.10-78.37)	67.82±42.66 (48.90-86.73)	115.50±60.32 (19.51-211.49)	7.048	4	<b>.000<sup>i</sup></b>	4.882	3	<b>.003<sup>af</sup></b>
TPADT	M	23.69±15.19 (21.52-25.86)	27.25±15.44 (24.66-29.84)	27.99±15.71 (24.66-31.32)	34.02±17.11 (29.48-38.56)	67.47±47.14 (41.36-93.57)	24.175	4	<b>.000<sup>i</sup></b>	6.806	3	<b>.000<sup>b</sup></b>
	W	23.04±11.71 (20.79-25.28)	27.17±16.55 (23.20-31.15)	31.50±18.51 (25.42-37.58)	31.86±20.11 (22.95-40.78)	51.00±24.28 (12.37-89.63)	5.518	4	<b>.000<sup>i</sup></b>	4.121	3	<b>.007<sup>af</sup></b>
TPAGT	M	23.77±17.16 (21.33-26.22)	25.90±17.69 (22.93-28.87)	25.86±16.38 (22.37-29.35)	28.27±16.53 (23.80-32.74)	50.93±37.68 (29.17-72.69)	7.686	4	<b>.000<sup>i</sup></b>	1.148	3	.329
	W	21.35±13.44 (18.77-23.92)	23.38±14.24 (19.96-26.80)	25.63±17.71 (19.81-31.45)	26.59±21.09 (17.24-35.94)	49.50±19.16 (19.02-79.98)	3.829	4	<b>.005<sup>i</sup></b>	1.214	3	.305
TOPAT	M	10.94±17.34 (7.15-14.73)	18.47±31.12 (11.79-25.14)	14.51±15.89 (9.62-19.40)	16.51±16.63 (11.26-21.76)	72.30±99.93 (0.82-143.78)	10.060	4	<b>.000<sup>i</sup></b>	1.616	3	.186
	W	8.89±12.60 (4.69-13.09)	13.26±12.78 (9.11-17.40)	13.36±11.04 (8.80-17.92)	18.36±17.99 (6.28-30.45)	20.00±21.17 (-32.58-72.58)	1.549	4	.193	1.787	3	.154
TSTDS	M	2.84±1.36 (2.66-3.02)	2.38±1.34 (2.16-2.61)	2.26±1.19 (2.01-2.51)	2.77±1.20 (2.44-3.11)	4.75±3.79 (2.73-6.77)	12.342	4	<b>.000<sup>i</sup></b>	6.143	3	<b>.000<sup>c</sup></b>
	W	2.79±1.31 (2.56-3.01)	2.26±1.13 (1.99-2.53)	2.34±1.21 (1.94-2.74)	2.50±1.28 (1.90-3.10)	3.25±0.50 (2.45-4.05)	2.741	4	<b>.029</b>	3.220	3	<b>.023</b>
TGNDSD	M	1.74±0.78 (1.62-1.87)	1.65±0.92 (1.47-1.82)	1.73±0.86 (1.53-1.93)	1.95±0.99 (1.64-2.26)	2.45±1.63 (1.36-3.55)	2.643	4	<b>.033<sup>i</sup></b>	1.288	3	.278
	W	1.79±0.90 (1.62-1.96)	1.77±0.86 (1.56-1.98)	1.82±0.80 (1.55-2.10)	1.62±0.74 (1.28-1.96)	2.25±1.26 (0.25-4.25)	.499	4	.737	.274	3	.844
TPAS	M	2.26±1.18 (2.09-2.42)	2.40±1.34 (2.17-2.62)	2.23±1.22 (1.97-2.49)	2.70±1.23 (2.37-3.03)	5.25±4.14 (3.04-7.46)	17.409	4	<b>.000<sup>i</sup></b>	2.164	3	.091
	W	2.20±1.05 (2.00-2.40)	2.28±1.10 (2.01-2.54)	2.45±1.27 (2.03-2.86)	2.41±1.40 (1.79-3.03)	3.25±0.50 (2.45-4.05)	1.152	4	.333	.564	3	.639
STDST	M	16.29±10.66 (14.91-17.67)	19.71±13.25 (17.49-21.93)	19.37±12.58 (16.70-22.03)	14.86±9.50 (12.24-17.48)	16.22±6.15 (12.95-19.50)	3.236	4	<b>.012</b>	4.153	3	<b>.006<sup>bc</sup></b>
	W	13.26±9.65 (11.60-14.91)	17.05±10.47 (14.54-19.57)	16.27±7.77 (13.72-18.83)	14.30±8.88 (10.15-18.46)	12.67±5.79 (3.46-21.87)	2.122	4	.079	2.744	3	<b>.044</b>
GNDST	M	11.53±8.01 (10.25-12.81)	12.98±9.57 (11.17-14.79)	12.76±8.73 (10.74-14.78)	12.58±9.26 (9.69-15.46)	9.00±6.45 (4.67-13.34)	.909	4	.459	.691	3	.558
	W	13.03±8.67 (11.39-14.68)	16.07±9.80 (13.64-18.50)	15.34±12.16 (11.10-19.58)	16.12±9.28 (11.90-20.34)	7.69±6.64 (-2.87-18.25)	1.783	4	.133	1.701	3	.168
PAST	M	23.50±9.25 (22.18-24.82)	28.12±16.92 (25.28-30.96)	30.68±22.95 (25.82-35.54)	28.61±9.01 (26.19-31.02)	30.41±16.27 (21.75-39.08)	4.450	4	<b>.002</b>	5.665	3	<b>.001<sup>ad</sup></b>
	W	22.01±7.84 (20.50-23.51)	25.17±7.97 (23.26-27.09)	27.33±8.46 (24.54-30.11)	29.09±13.01 (23.32-34.86)	36.25±20.97 (2.89-69.62)	6.433	4	<b>.000<sup>i</sup></b>	6.638	3	<b>.000<sup>af</sup></b>
PADST	M	10.49±3.53 (9.99-10.99)	11.87±4.09 (11.19-12.56)	13.61±7.83 (11.95-15.27)	13.20±4.03 (12.12-14.28)	12.20±4.31 (9.90-14.49)	7.906	4	<b>.000<sup>a</sup></b>	10.441	3	<b>.000<sup>gh</sup></b>
	W	10.73±3.49 (10.06-11.40)	11.93±3.47 (11.09-12.76)	13.19±4.09 (11.85-14.54)	14.04±7.23 (10.83-17.24)	15.90±8.27 (2.73-29.06)	5.457	4	<b>.000<sup>ai</sup></b>	6.225	3	<b>.000<sup>af</sup></b>
PAGST	M	10.80±5.54 (10.01-11.59)	11.36±6.81 (10.22-12.50)	12.77±10.55 (10.54-15.01)	10.41±5.22 (9.02-11.81)	8.25±5.41 (5.37-11.13)	2.160	4	.072	1.888	3	.131
	W	9.85±4.89 (8.91-10.78)	10.46±4.50 (9.38-11.54)	10.51±4.39 (9.07-11.96)	10.57±4.76 (8.46-12.68)	15.44±6.62 (4.90-25.98)	1.492	4	.205	.378	3	.769
PAOST	M	5.05±7.76 (3.36-6.75)	8.10±16.52 (4.56-11.64)	8.64±14.82 (4.07-13.20)	7.14±7.51 (4.73-9.54)	12.71±15.63 (1.53-23.89)	1.297	4	.272	1.114	3	.344
	W	4.16±6.24 (2.08-6.25)	5.24±4.73 (3.71-6.78)	5.65±4.64 (3.74-7.56)	8.81±10.88 (1.50-16.12)	6.56±7.18 (-11.29-24.40)	1.294	4	.277	1.698	3	.172

Abbreviations in table 2. The significant differences ( $p < 0.05$ ) are shown in bold. CI=confidence intervals. a) The first minute presents significant differences to the rest of the combat minutes, b) The last minute presents significant differences to the rest of the combat minutes, c) The second and third minutes show significant difference to the last two minutes, d) The third minute presents significant differences to the rest of the combat minutes, e) The first and last minutes show significant difference to the last two minutes, f) The first and second minutes show significant difference to the last two minutes, g) The second and last minutes show significant difference to the last two minutes, h) The third and last minutes show significant difference to the last two minutes, i) The GS minute presents significant differences to the rest of the combat minutes

**Table 6.** Comparison between men and women with VI of the sequential and temporary parameters of judo combat in the different combat minutes. Results of the effect size (Cohen's d) in the differences found.

Category	1m				2m				3m		4m		GS					
	T-test		Cohen's d		T-test		Cohen's d		T-test		T-test		Cohen's d		T-test		Cohen's d	
	t	p	d	r	t	p	d	r	t	p	t	p	d	r	t	p	d	r
<b>Total Standing Time</b>	4.133	<b>.000</b>	0.450	0.211	2.733	<b>.007</b>	0.381	0.177	1.364	.175	2.013	<b>.048</b>	0.496	0.218	1.085	.292		
<b>Total Ground Time</b>	-1.684	.093			-2.263	<b>.025</b>	-0.333	-0.160	-989	.325	-.896	.374			.611	.551		
<b>Total Fight Time</b>	1.413	.159			.431	.667			1.127	.262	.747	.457			1.989	.065		
<b>Total Pause Time</b>	1.305	.193			1.250	.213			-.708	.480	.551	.583			.494	.627		
<b>Total Pause Displacement Time</b>	.385	.700			.033	.973			-1.090	.278	.477	.634			.665	.515		
<b>Total Pause Gripping Time</b>	1.263	.208			1.030	.304			.071	.944	.372	.711			.072	.943		
<b>Total Other Pause Time</b>	.646	.520			1.006	.317			.320	.750	-.322	.749			.875	.400		
<b>Total Standing Sequences</b>	.349	.727			.642	.522			-.348	.729	.852	.397			.775	.448		
<b>Total Ground Sequences</b>	-.437	.663			-.877	.382			-.536	.593	1.366	.177			.225	.825		
<b>Total Pause Sequences</b>	.441	.660			.647	.519			-.919	.360	.890	.376			1.879	.078		
<b>Standing Sequence Time</b>	2.703	<b>.007</b>	0.294	0.140	1.453	.148			1.683	.095	.228	.820			1.046	.310		
<b>Ground Sequence Time</b>	-1.446	.149			-2.047	<b>.042</b>	-0.320	-0.153	-1.257	.212	-1.430	.158			.347	.734		
<b>Pause Sequence Time</b>	1.407	.160			1.371	.172			.874	.384	-.189	.851			-.610	.550		
<b>Pause-Displacement Sequence Time</b>	-.555	.580			-.096	.924			.312	.755	-.653	.516			-1.276	.218		
<b>Pause-Grip Sequence Time</b>	1.491	.137			.993	.322			1.270	.207	-.120	.905			-2.284	<b>.035</b>	-1.277	-0.455
<b>Pause-Other Sequence Time</b>	.614	.541			1.057	.292			.977	.332	-.592	.557			.646	.531		

The significant differences ( $p < 0.05$ ) are shown in bold. Expression of the effect size:  $d$  y  $r$ ,  $d < 0.2$  (null),  $d = 0.2-0.49$  (small),  $d = 0.5-0.80$  (moderate) and  $d > 0.8$  (large).

**Table 7.** Results of the effect size comparing the 2018 combats to the 1998 combats in women and men judokas with VI (Gutiérrez-Santiago et al., 2011, 2012, 2013; Gutiérrez Santiago, 2005).

	Category	Total		-60 kg		-66 kg		-73 kg		-81 kg		-90 kg		-100 kg		+100 kg	
		d	r	d	r	d	r	d	r	d	r	d	r	d	r	d	r
2018 DV vs 1998 DV (Men)	TTC	-0.033	-0.016	0.349	0.164	-0.183	-0.091	0.149	0.074	-0.176	-0.088	-0.220	-0.109	-0.048	-0.024	0.766	0.296
	TTPIE	0.117	0.058	0.343	0.161	0.493	0.239	0.161	0.080	-0.199	-0.099	-0.029	-0.014	-0.022	-0.011	0.743	0.288
	TTSU	-0.371	-0.181	0.208	0.097	-0.622	-0.297	-0.055	-0.027	-0.742	-0.347	-0.639	-0.303	0.138	0.069	0.243	0.097
	TTW	-0.055	-0.027	0.377	0.177	-0.049	-0.025	0.194	0.096	-0.455	-0.222	-0.280	-0.139	-0.040	-0.020	0.696	0.272
	TTPA	-0.006	-0.003	0.183	0.084	-0.230	-0.114	0.108	0.054	-0.117	-0.059	0.069	0.034	0.186	0.093	0.783	0.260
	STPIE	-0.291	-0.143	0.125	0.059	-0.404	-0.198	-0.147	-0.073	-0.327	-0.161	-0.411	-0.201	-0.417	-0.202	0.554	0.219
	STSU	-0.168	-0.084	0.530	0.250	-0.397	-0.194	-0.068	-0.034	-0.520	-0.250	-0.333	-0.161	0.338	0.166	0.439	0.192
	STPA	-0.121	-0.061	0.244	0.117	-0.176	-0.087	-0.038	-0.019	-0.268	-0.133	-0.135	-0.066	-0.101	-0.050	0.846	0.340
	TSPIE	0.572	0.273	0.460	0.214	0.888	0.405	0.733	0.343	0.206	0.103	0.478	0.232	0.864	0.393	0.352	0.141
	TSSU	-0.125	-0.062	-0.313	-0.144	-0.128	-0.064	0.197	0.096	-0.480	-0.233	-0.021	-0.010	-0.349	-0.171	-0.199	-0.079
	TSPA	0.692	0.326	0.590	0.262	0.386	0.189	0.595	0.284	0.825	0.381	0.388	0.188	0.949	0.429	2.544	0.658
	Category	Total		-48 kg		-52 kg		-57 kg		-70 kg		+70 kg					
		d	r	d	r	d	r	d	r	d	r	d	r	d	r	d	r
2018 DV vs 1998 DV (Women)	TTC	-0.179	-0.073	0.013	0.005	0.723	0.306	-0.406	-0.183	-0.266	-0.110	-1.017	-0.377				
	TTPIE	0.220	0.089	0.230	0.092	1.103	0.439	-0.254	-0.116	0.579	0.234	-0.571	-0.223				
	TTSU	-0.931	-0.341	0.013	0.005	-0.482	-0.183	-1.933	-0.637	-0.398	-0.159	-2.155	-0.653				
	TTW	-0.146	-0.059	0.082	0.033	0.834	0.347	-0.634	-0.280	0.257	0.106	-1.130	-0.412				
	TTPA	-0.448	-0.171	-0.849	-0.275	0.305	0.117	-0.537	-0.229	-0.938	-0.351	-0.504	-0.216				
	STPIE	-0.356	-0.143	-0.226	-0.090	0.562	0.242	-0.494	-0.222	-0.233	-0.097	-1.345	-0.474				
	STSU	-0.438	-0.182	-0.247	-0.101	0.242	0.108	-0.576	-0.260	-0.467	-0.195	-1.105	-0.422				
	STPA	-0.148	-0.063	-0.037	-0.016	0.636	0.275	-0.336	-0.156	-0.119	-0.050	-0.949	-0.385				
	TSPIE	0.829	0.319	0.870	0.329	1.608	0.581	0.233	0.106	1.072	0.407	0.582	0.227				
	TSSU	-0.100	-0.039	-0.403	-0.163	0.351	0.134	-0.024	-0.010	0.518	0.206	-0.734	-0.282				
	TSPA	0.265	0.102	0.429	0.143	1.177	0.413	0.569	0.242	-0.942	-0.353	0.988	0.398				

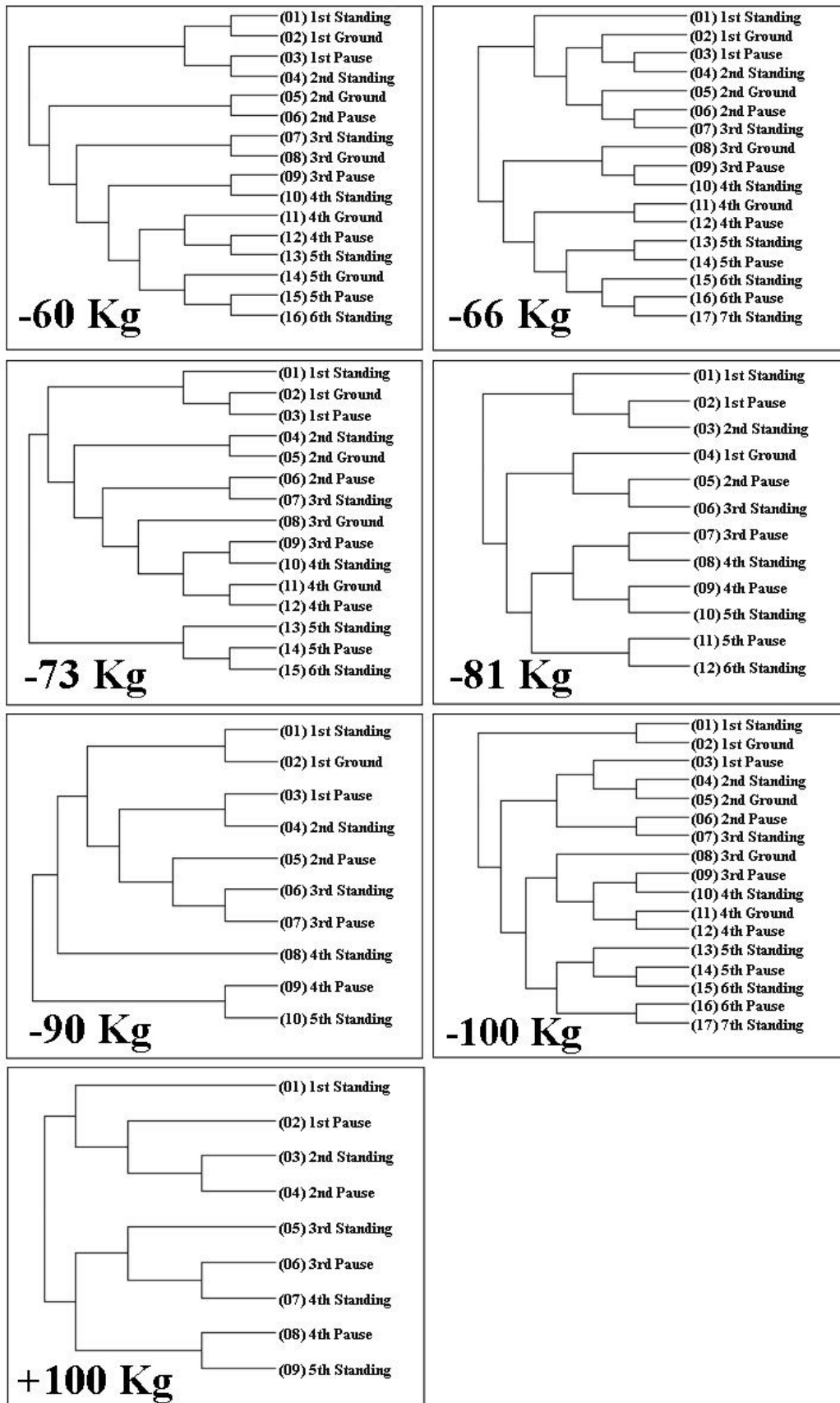
Expression of the effect size:  $d$  y  $r$ ,  $d < 0.2$  (null),  $d = 0.2 - 0.49$  (small),  $d = 0.5 - 0.80$  (moderate) y  $d > 0.8$  (large). The female weight category data has been taken from a previous study (Gutiérrez-Santiago, Gutiérrez, et al., 2020)

**Table 8.** Temporal structure “type” of a judo combat for men and women with VI in the different weight categories.

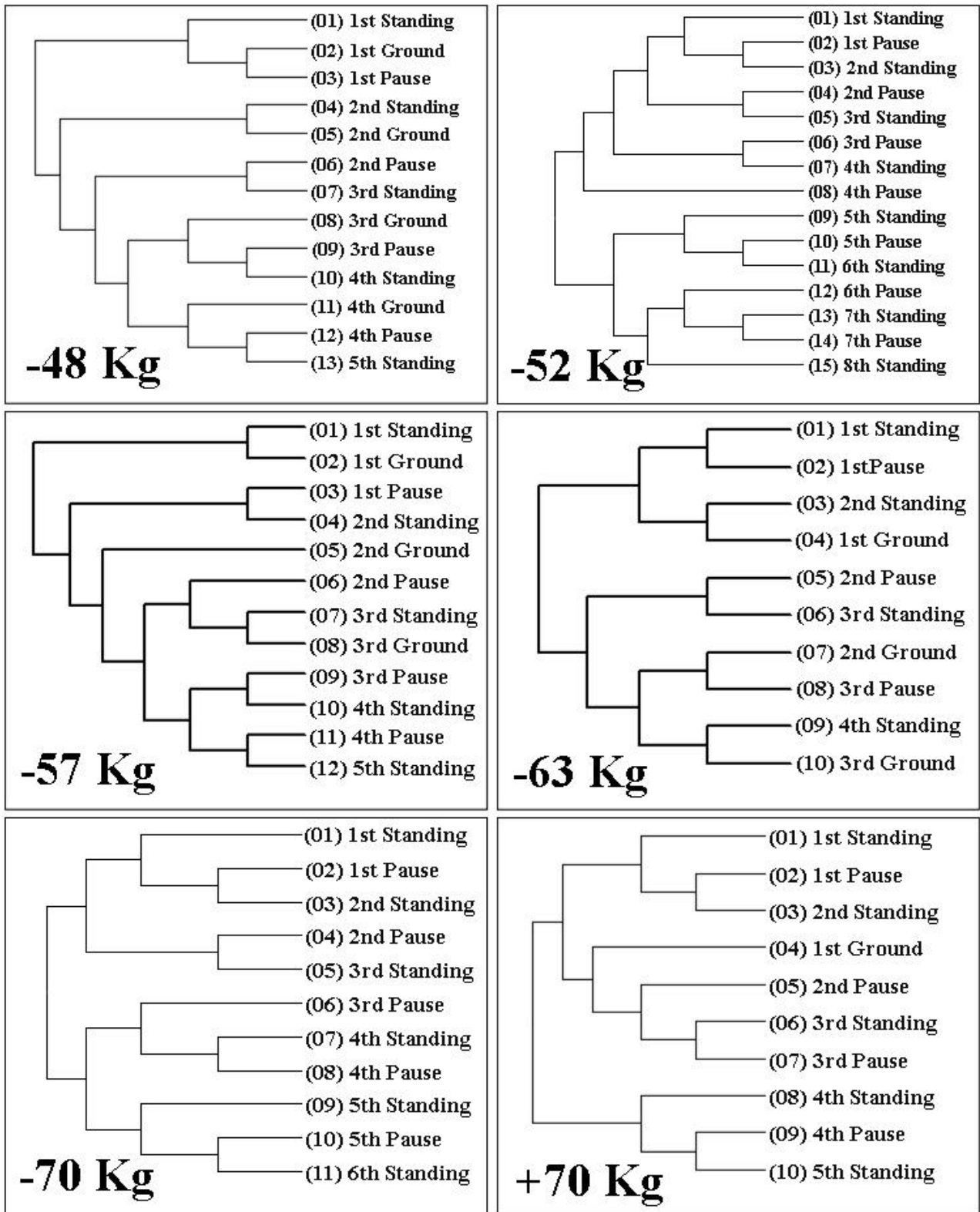
<i>Men</i>													
<i>-60 kg</i>	<i>Time</i>	<i>-66 kg</i>	<i>Time</i>	<i>-73 kg</i>	<i>Time</i>	<i>-81 kg</i>	<i>Time</i>	<i>-90 kg</i>	<i>Time</i>	<i>-100 kg</i>	<i>Time</i>	<i>+100 kg</i>	<i>Time</i>
CS		CS		CS		CS		CS		CS		CS	
1st STD	14.38	1st STD	18.10	1st STD	12.43	1st STD	15.21	1st STD	19.07	1st STD	17.40	1st STD	22.18
1st GND	12.36	1st GND	11.96	1st GND	13.24	1st Pause	25.96	1st GND	11.63	1st GND	11.40	1st GND	13.62
1st Pause	26.40	1st Pause	20.44	1st Pause	23.02	2nd STD	15.21	1st Pause	25.32	1st Pause	28.78	1st Pause	30.22
2nd STD	14.38	2nd STD	18.10	2nd STD	12.43	1st GND	9.71	2nd STD	19.07	2nd STD	17.40	2nd STD	22.18
2nd GND	12.36	2nd GND	11.96	2nd GND	13.24	2nd Pause	25.96	2nd Pause	25.32	2nd GND	11.40	2nd Pause	30.22
2nd Pause	26.40	2nd Pause	20.44	2nd Pause	23.02	3rd STD	15.21	3rd STD	19.07	2nd Pause	28.78	3rd STD	22.18
3rd STD	14.38	3rd STD	18.10	3rd STD	12.43	3rd Pause	25.96	2nd GND	11.63	3rd STD	17.40	2nd GND	13.62
3rd GND	12.36	3rd GND	11.96	3rd GND	13.24	4th STD	15.21	3rd Pause	25.32	3rd GND	11.40	3rd Pause	30.22
3rd Pause	26.40	3rd Pause	20.44	3rd Pause	23.02	2nd GND	9.71	4th STD	19.07	3rd Pause	28.78	4th STD	22.18
4th STD	14.38	4th STD	18.10	4th STD	12.43	4th Pause	25.96	3rd GND	11.63	4th STD	17.40	4th Pause	30.22
4th GND	12.36	4th GND	11.96	4th GND	13.24	5th STD	15.21	4th Pause	25.32	4th GND	11.40	5th STD	22.18
4th Pause	26.40	4th Pause	20.44	4th Pause	23.02	5th Pause	25.96	5th STD	19.07	4th Pause	28.78	CE	
5th STD	14.38	5th STD	18.10	5th STD	12.43	6th STD	15.21	CE		5th STD	17.40		
5th GND	12.36	5th Pause	20.44	5th Pause	23.02	CE				5th Pause	28.78		
5th Pause	26.40	6th STD	18.10	6th STD	12.43					6th STD	17.40		
6th STD	14.38	6th Pause	20.44	CE						6th Pause	28.78		
CE		7th STD	18.10							7th STD	17.40		
		CE								CE			
<i>Women</i>													
<i>-48 kg</i>	<i>Time</i>	<i>-52 kg</i>	<i>Time</i>	<i>-57 kg</i>	<i>Time</i>	<i>-63 kg</i>	<i>Time</i>	<i>-70 kg</i>	<i>Time</i>	<i>+70 kg</i>	<i>Time</i>		
CS		CS		CS		CS		CS		CS			
1st STD	13.30	1st STD	12.26	1st STD	9.21	1st STD	14.40	1st STD	15.81	1st STD	16.2		
1st GND	14.85	1st GND	13.32	1st GND	16.28	1st Pause	22.29	1st GND	17.84	1st Pause	26.98		
1st Pause	24.81	1st Pause	20.31	1st Pause	21.2	2nd STD	14.40	1st Pause	23.71	2nd STD	16.2		
2nd STD	13.30	2nd STD	12.26	2nd STD	9.21	1st GND	13.19	2nd STD	15.81	1st GND	10.34		
2nd GND	14.85	2nd Pause	20.31	2nd GND	16.28	2nd Pause	22.29	2nd Pause	23.71	2nd Pause	26.98		
2nd Pause	24.81	3rd STD	12.26	2nd Pause	21.2	3rd STD	14.40	3rd STD	15.81	3rd STD	16.2		
3rd STD	13.30	2nd GND	13.32	3rd STD	9.21	2nd GND	13.19	2nd GND	17.84	2nd GND	10.34		
3rd GND	14.85	3rd Pause	20.31	3rd GND	16.28	3rd Pause	22.29	3rd Pause	23.71	3rd Pause	26.98		
3rd Pause	24.81	4th STD	12.26	3rd Pause	21.2	4th STD	14.40	4th STD	15.81	4th STD	16.2		
4th STD	13.30	3rd GND	13.32	4th STD	9.21	3rd GND	13.19	3rd GND	17.84	3rd GND	10.34		
4th GND	14.85	4th Pause	20.31	4th Pause	21.2	CE		4th Pause	23.71	4th Pause	26.98		
4th Pause	24.81	5th STD	12.26	5th STD	9.21			5th STD	15.81	5th STD	16.2		
5th STD	13.30	5th Pause	20.31	CE				4th GND	17.84	CE			
CE		6th STD	12.26					5th Pause	23.71				
		4th GND	13.32					6th STD	15.81				
		6th Pause	20.31					CE					
		7th STD	12.26										
		7th Pause	20.31										
		8th STD	12.26										
		CE											

CS=Combat Star; STD = Standing Sequence; GND = Ground Sequence; CE=Combat End. The female weight category data has been taken in a previous study (Gutiérrez-Santiago, Gutiérrez, et al., 2020).

## Figures



**Figure 1.** Patterns of the fight sequences (standing and on the ground) and pause in the distinct men's weight categories.



**Figure 2.** Patterns of the fight sequences (standing and on the ground) and pause in the distinct women's weight categories.