Does the ranking position predict the final combat outcome in Senior and Junior judo athletes?

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Abstract

The aim of this study was to identify whether ranking position predicts combat result in Senior and Junior male and female Spanish judo athletes, and how it influences the different stages of the championship. The sample was composed of 683 combats from the Senior (male = 164; female = 158 combats) and Junior (male = 193; female = 168 combats) Spain 2014 Judo National Championships, including all weight categories. Data were obtained from the official classification published by the Spanish Judo Federation. Main results revealed important advantages of high-ranked athletes, finding differences between sexes and championship stages. Specifically, high-ranked athletes had more probability of winning and passing to the next stage. This advantage appears to be greater at the initial phases in females but mitigated as the championship progresses. Interestingly, the quarterfinal appears to be a critical phase in which better skilled and prepared athletes are likely to win. Greater differences between better and lower-ranked were found in Junior females, especially at eliminatory and quarterfinals stages. On the contrary, the Junior male contest appears to be the most equitable competition. These results fuel the debate about the seeding process in judo championships.

Keywords: Judo; combat sports; situational variables; classification; performance analysis.

¿Predice la posición en el ranking el resultado final de combates de judo en las categorías júnior y sénior?

Resumen

El objetivo de este estudio fue identificar si la posición en el ranking predice el resultado del combate en judokas españoles júnior y sénior, categoría masculina y femenina, y si esto influye en las diferentes fases del campeonato. La muestra fueron 683 combates de los Campeonatos Nacionales de Judo 2014 (masculino = 164; femenino = 158) y Júnior (masculino = 193; femenino = 168), en todas las categorías de peso. El ranking se obtuvo de la clasificación oficial de la Federación Española de Judo. Los resultados principales mostraron importantes ventajas para los atletas en posiciones altas del ranking, encontrando diferencias entre sexos y las fases del campeonato. Específicamente, los atletas en posiciones altas tenían más probabilidades de vencer y pasar a la siguiente ronda. Esta ventaja parece ser mayor en las fases iniciales en féminas, pero se mitiga a medida que avanza el campeonato. Curiosamente, los cuartos de final parecen ser una fase crítica, en la que los atletas más hábiles y mejor suelen ganar. Se encontraron mayores diferencias los mejor y peor posicionados en el ranking en mujeres júnior, especialmente en las fases eliminatoria y cuartos de final. Por el contrario, la competición júnior masculina parece ser la más

A posição no ranking prediz o desfecho final de combate em atletas de judô das classes Sênior e Júnior?

Resumo

O objetivo deste estudo foi identificar se a posição no ranking prediz o resultado de combate em atletas de judô espanhóis dos sexos masculino e feminino, das classes Sênior e Júnior, e como ele influencia os diferentes estágios do Campeonato. A amostra foi composta por um total de 683 combates das classes Sênior (masculino = 164; feminino = 158 combates) e Júnior (masculino = 193; feminino = 168 combates) do Campeonato Espanhol de 2014, incluindo todas as categorias de peso. Os dados foram obtidos a partir da classificação publicada pela Federação Espanhola de Judô. Os resultados principais revelaram importante vantagens dos atletas melhores ranqueados, com diferenças entre os sexos e os estágios do campeonato. Especificamente, atletas melhores ranqueados tinham maior probabilidade de vencer e passar para o próximo estágio. Essa vantagem parece ser maior nas fases iniciais da competição no sexo feminino, mas diminui conforme a competição progride. Interessantemente, as quartas de final parecem ser a fase crítica na qual atletas melhores ranqueados têm maior probabilidade de vencer. Maiores diferenças entre os melhores e piores ranqueados foram observadas no Júnior feminino, especialmente nas fases eliminatórias e de quartas de finais. Contrariamente, as

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equilibrada. Estos resultados fomentan el debate sobre el proceso de designación de cabezas de serie en los campeonatos de judo.

Palabras clave: Judo; deportes de combate; variables situacionales; clasificación; análisis de rendimiento.

disputas do Júnior masculino parecem ser a competição mais equilibrada. Estes resultados ampliam o debate sobre o processo de chaveamento em competições de judô.

Palavras-chave: Judô; esportes de combate; variáveis situacionais; classificação; análise do desempenho.

1. Introduction

The last decade has seen a growth in the analysis of sport performance, since it provides information that improves the training and competition processes (Drust, 2010; O'Donoghue, 2015). These data extracted from competition are highly appreciated for coaches to develop training programmes and prepare practice sessions according to competition constraints (McGarry, 2009). Furthermore, specific information on which aspects enhance athletes' performance to better succeed and increase winning probability lead to a better understanding of sport practice, contributing to its evolution (Glazier, 2010).

One of the topics in which researchers have shown special interest is the influence of the competition context on athletes' behaviours and game performance. Particularly, some authors have defined the concept of "situational variables", including five conditions (Gómez, Lago, & Pollard, 2013): type of competition (e.g., regular season, World Cup, Olympic Games), game period, game location (home vs. away), match status (score situation) and quality of opposition (the opponent level). In this sense, evidence has reported the impact of situational variables on performance and game in team sports like soccer (e.g., Lago-Peñas, Gómez, Megías-Navarro, & Pollard, 2016), basketball (e.g., Gomez, DelaSerna, Lupo, & Sampaio, 2014) or volleyball (e.g., Marcelino, Mesquita, & Sampaio, 2011) and racket sports like padel (Courel-Ibáñez & Sánchez-Alcaraz, 2017). In these disciplines, authors agree on the influence of the ranking position and the opponent level on players' behaviour and performance. In this sense, researchers have observed that the higher ranking position, the better the performance and winning chances and, essentially, the greater the differences between contenders. In combat sports like judo, ranking position takes special importance since it determines the places for the most important competitions (i.e., National Championships, European Championship, Olympic Games, World Championship). However, there are some controversies concerning the potential advantage of a better ranking position on the final combat outcome in judo, especially in youth competitions.

In a first approach to the topic, Julio et al. (2011) made a 10-year tracking (1999-2009) to compare if judo athletes maintained their competitive level in terms of championships won. According to their findings, only 7% of the male and 5% of the female athletes kept a constant competitiveness along the years. In contrast, Daniel and Daniel (2013) gathered information from a variety of rankings and classifications (i.e., International Judo Federation (IJF) World Ranking List, World Championship 2011 classification and Olympic Games 2008 classification) and observed that ranking position could be an accurate predictor of medal winning in Olympic Games judo competitors. More precisely, they found that the 81.3% of judo athletes that were within the Top-8 IJF World Ranking List in 2012 won a medal in the same-year Olympic Games. Interestingly enough, from the variety of rankings explored, they were not able to find these relationships in women's 52 kg/men's 66 kg categories (i.e., <5% women and <10% male were medallists), which highlighted the greater competitiveness and balance in these weight categories. This study, however, used descriptive analysis such as frequency counts rather than statistical inference, which limits its extrapolation. More recent investigations used predictive regression analyses to indicated that the IJF World Ranking List presented low predictive value for Olympic Games (Franchini & Julio, 2015) and World Championship (Breviglieri, Possa, Campos, Humberstone, & Franchini, 2018) performance. Other authors have conducted a Bayesian inference approach based on conditional probabilities (Guilheiro & Franchini, 2017) and reported that the percentage of seeded athletes winning medals was much lower (i.e., approximately 35.7% to 44.6%) than the previous findings from Daniel and Daniel (2013).

In addition to the IJF Ranking List, some countries have their own federative ranking lists according to athletes' championships standings along the year. For example, the Spanish Judo

Federation gives distinctive punctuations regarding the competition and age category. For Juniors (under 21 years old), scoring championships are World Championship, European Championship, Continental Cup Junior and Senior, European Málaga Cup and Spanish Junior and Senior Championships. For Seniors, competitions are World Championship, European Championship, Grand Slam, Grand Prix, Mediterranean Games, Continental Open and European Málaga Cup. Then, a minimum of points is required to be able to be seeded in the National Team and to compete in the National Championship. According to the Spanish Judo Federation rules and regulations (Spanish Judo Federation, 2018), for instance in Junior, the 5th position in a World Championships provides 50 points, whilst medals provide 150 (gold), 120 (silver) and 100 (bronze). Similarly, the European Championships provides 30 for the 5th position, and 100, 85 and 70 for the medals, respectively. The National Championship scores 30, 20 and 15 points for gold, silver and bronze medal positions, respectively.

In sum, given judo athletes are strongly conditioned by their ranking position to classify for the most important competitions, there is a need to further explore the consequences of this handicap. In this sense, limited information is available on how ranking position affects combat result regarding the championship stage (i.e., first round, repechage, or final round), as well as differences between young and Senior, and male and female athletes. Such knowledge might have implications for evaluating the degree of competitiveness within championships and debate about the strict classification system in judo.

Therefore, the aims of this study were to identify how ranking position predicts combat result in Senior and Junior male and female Spanish judo athletes, and how it influences along the different stages of the championship. Given the incremental competitive level throughout the championship stages, we hypothesized a higher influence of raking position on the final combat result during the initial phases, whilst the lowest influence (i.e., great equality) at the final and semi-final phases. Potential differences between age and gender groups were expected, but difficult to estimate given the lack of previous reports, and the controversy between the few existing ones.

2. Method

2.1. Sample and variables

The sample was composed of all the 683 combats from the Senior (male = 164; female = 158 combats) and Junior (male = 193; female = 168 combats) Spain 2014 Judo National Championships, including all weight categories. Data were obtained from the official classification published by the Spanish Judo Federation (http://www.rfejudo.com). This Championship recruits the best judo athletes from the country and achieving a high classification is critical to become a member of the National Team and compete in World and European tournaments. Ranking position of winner (n = 683) and defeated (n = 683) athletes for each combat was registered, following the official list set by the Spanish Judo Federation. Hence, we obtained 1366 records in total, pertaining to winning athletes' ranking position (n = 683, one per combat) and defeated athletes' ranking position (n = 683, one per combat). The championship stage of each combat was also considered, distinguishing between eliminatory, repechage, bronze medal, quarterfinals, semi-finals, and finals. Only combats that were disputed were included in the sample, excluding victories by walkover (W.O.).

2.3. Statistical analysis

Preliminary analysis was done to verify assumptions to apply further calculations: normality of variables (Kolmogorov-Smirnov test) and homogeneity of variances (Brown-Forsythe robust test) (Brown & Forsythe, 1974), which included the absence of outliers (Grubbs Outlier Test) (Grubbs & Beck, 1972). Homogeneity of variances was verified for all genders and age groups. Given the non-normal distribution of the sample, distribution-free tests were carried out.

Spearman's correlations (r) were calculated to examine the association between the studied variables, interpreted as follows: < 0.10 = *trivial*; 0.10 - 0.29 = *small*; 0.30 - 0.49 = *moderate*; and > 0.49 = *large* (Cohen, 1992). Mann-Witney U test was used to identify the differences between the distribution of ranking position regarding the combat result at each championship stage and within

each age and sex groups. Mean differences (MD) were expressed in mean ± standard error (MD = M ± SE).

Odds ratio (OR) and their 95% confidence intervals (CI) were calculated by a series of binomial logistic regressions to predict (i) the influence of ranking position, age, sex, weight category and championship stage on combat result, and (ii) the influence of ranking position on combat result regarding sex and age. Significations of predictors were assessed by means of Wald's test. The level of significance was set at $p < 0.05$, and statistical analyses were conducted in MedCalc Statistical Software version 18.2.1 (MedCalc Software bvba, Ostend, Belgium) and SPSS software version 20.0 (IBM Corp., Armonk, NY, USA).

3. Resuls

Overall, correlation analyses showed negative associations ($p < 0.01$) between ranking position and championship stage ($r = -0.28$, *small*), and final combat result ($r = -0.18$, *small*). A negative association was observed between ranking position and championship stage (i.e., the higher the stage, the lower the ranking position) in all age and sex groups. However, the negative association between ranking and combat result (i.e., the higher the ranking position, the greater the winning chances) was only observed ($p < 0.01$) in Senior female ($r = -0.29$, *small*), Junior female ($r = -0.23$ *small*) and Junior male ($r = -0.14$, *small*) competitions.

Comparison for ranking positions in winners and defeated along the championship stages are depicted in Figure 1 (Senior male), Figure 2 (Senior female), Figure 3 (Junior male) and Figure 4 (Junior female). Mann-Witney U test identified the following differences in ranking positions between winners and defeated along the championship: Senior male quarter final (MD = 4.9 ± 2.6 positions, $p = 0.005$); Senior female eliminatory (MD = 5.5 ± 1.3 positions, $p < 0.001$), and semi-final (MD = 3.4 ± 1.7 positions, $p = 0.027$); Junior female eliminatory (Diff = 4.1 ± 1.4 positions, $p = 0.001$) and quarter final (MD = 3.1 ± 1.2 positions, $p = 0.015$).

Binomial logistic regression analyses showed a significant increment on the likelihood of winning the combat for better-ranked athletes, with sex differences (Table 1). This model included the total sample ($n = 683$ winners and 683 defeated) predicting 58% of the athletes' result (i.e., the 58% of predicting results fit with the real observations). More specifically, it has been detected higher winning odds for high-ranked female athletes in eliminatory stage (both Senior and Junior), and for Senior male and Junior female athletes in quarterfinals (Table 2). These models predicted between 64-72% of the athletes' result.
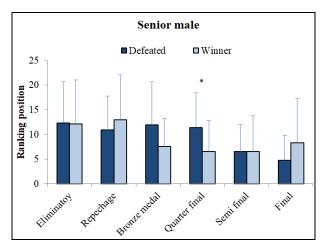

Figure 1. Raking position of winner and defeated senior male judo athletes in different competition phases (values are mean and standard deviation). Bars are the combat result: winners (light bar) and defeated (dark bar). Axis are ranking position (y-axis) and championship stage (x-axis). *Mann-Witney U test $p < 0.05$.

Figure 2. Raking position of winner and defeated senior female judo athletes in different competition phases (values are mean and standard deviation). Bars are the combat result: winners (light bar) and defeated (dark bar). Axis are ranking position (y-axis) and championship stage (x-axis). *Mann-Witney U test $p < 0.05$
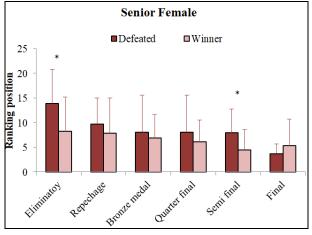
Figure 3. Raking position of winner and defeated junior male judo athletes in different competition phases (values are mean and standard deviation). Bars are the combat result: winners (light bar) and defeated (dark bar). Axis are ranking position (y-axis) and championship stage (x-axis). *Mann-Witney *U* test *p* < 0.05.

Figure 4. Raking position of winner and defeated junior female judo athletes in different competition phases (values are mean and standard deviation). Bars are the combat result: winners (light bar) and defeated (dark bar). Axis are ranking position (y-axis) and championship stage (x-axis). *Mann-Witney *U* test *p* < 0.05.
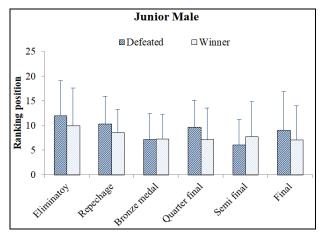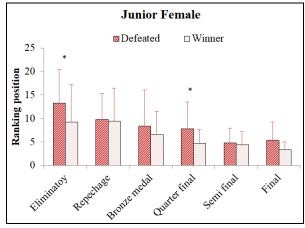
Table 1. Relationship between studied variables and combat result.

Predictors	B (SE)	OR (95% CI)	p
Ranking position	*-.090 (.040)*	*0.914 (0.846 - 0.989)*	*.025**
Age	.036 (.185)	1.036 (0.721 - 1.490)	.848
Sex	-.357 (.185)	0.700 (0.487 - 1.007)	.054
Weight Category	.012 (.045)	1.012 (0.928 - 1.105)	.783
Championship Stage	.287 (.197)	1.332 (0.905 - 1.961)	.146
Age * Ranking	-.005 (.016)	0.995 (0.964 - 1.028)	.775
*Sex * Ranking*	*.045 (.016)*	*1.046 (1.013 - 1.081)*	*.007**
Weight Category * Ranking	-.003 (.017)	0.997 (0.989 - 1.006)	.535
Phase * Ranking	-.015 (.004)	0.985 (0.954 - 1.018)	.375

*Wald's test significance. Outcome: Combat result (reference: losing). B: Beta coefficient; SE: Standard error; OR: Odds ratio; CI: Confidence intervals; R^2: Nagelkerke =.034. Significant relationships are in italics.

Table 2. Relationship of athlete's ranking position and combat result.

Predictors		B (SE)	OR (95% CI)	p	%	R^2
Eliminatory						
Senior	Male	-.003 (.021)	0.997 (0.957 - 1.038)	.868	46.0	>.001
	Female	*-.125 (.034)*	*0.883 (0.826 - 0.943)*	*<.001**	*69.8*	*.195*
Junior	Male	-.037 (.023)	0.964 (0.921 - 1.009)	.114	56.3	.024
	Female	*-.072 (.026)*	*0.931 (0.884 - 0.980)*	*.006**	*72.6*	*.089*
Repechage						
Senior	Male	.033 (.030)	1.034 (0.976 - 1.096)	.258	56.6	.023
	Female	-.051 (.039)	0.951 (0.880 - 1.027)	.199	63.2	.031
Junior	Male	-.065 (.042)	0.937 (0.863 - 1.017)	.119	57.4	.036
	Female	-.007 (.036)	0.993 (0.925 - 1.066)	.842	52.6	.001
Bronze medal						
Senior	Male	-.089 (.062)	0.915 (0.811 - 1.032)	.147	60.7	.114
	Female	-.032 (.067)	0.969 (0.850 - 1.104)	.635	50.0	.012
Junior	Male	.003 (.071)	1.003 (0.872 - 1.153)	.972	50.0	>.001
	Female	-.046 (.059)	0.955 (0.850 - 1.072)	.431	56.3	.027
Quarter finals						
Senior	*Male*	*-.118 (.049)*	*0.889 (0.808 - 0.978)*	*.015**	*69.6*	*.164*
	Female	-.056 (.048)	0.945 (0.860 - 1.038)	.240	53.6	.036
Junior	Male	-.072 (.045)	0.930 (0.852 - 1.016)	.108	57.8	.057
	Female	*-.197 (.086)*	*0.821 (0.693 - 0.972)*	*.022**	*64.3*	*.163*

Semi finals						
Senior	Male	.010 (.061)	1.000 (0.887 - 1.128)	>.999	50.0	>.001
	Female	*-.183 (.099)*	*0.833 (0.686 - 1.011)*	*.065*	*67.9*	*.183*
Junior	Male	.047 (.058)	1.048 (0.935 - 1.175)	.422	55.9	.026
	Female	-.045 (.123)	0.956 (0.751 - 1.216)	.714	46.9	.006
Finals						
Senior	Male	.084 (.094)	1.088 (0.905 - 1.308)	.372	57.1	.090
	Female	.110 (.149)	1.116 (0.833 - 1.496)	.462	50.0	.055
Junior	Male	-.042 (.074)	0.959 (0.830 - 1.109)	.573	56.3	.027
	Female	-.207 (.214)	0.813 (0.535 - 1.236)	.333	56.3	.081

*Wald's test significance (p<0.05). Outcome: Combat result (reference: losing). B: Beta coefficient; SE: Standard error; OR: Odds ratio; CI: Confidence intervals; % the percentage of predicting results that fit with the real observations. R^2: Nagelkerke. Significant relationships are in italics.

4. Discussion

This investigation was designed to verify how ranking position predicts combat result in Senior and Junior male and female Spanish judo athletes and its influences along the different stages of the championship. Main results confirmed our hypothesis and revealed important advantages of high-ranked athletes, finding differences between sexes and championship stages. Specifically, high-ranked athletes had more probability of winning and passing to the next stage, mainly in females, where ranking position seemed to have crucial influences on the likelihood of winning.

To our knowledge, this is the first study presenting the probabilities of winning in different phases of judo combats. Previous investigations only assessed the probability of winning medals in the Olympic Games (Daniel & Daniel, 2013; Guilheiro & Franchini, 2017) or used a multiple regression approach to predict Olympic Games or World Championship position based on the ranking list position of judo athletes (Franchini & Julio, 2015). Our results add further information about the potential advantage provided by a higher-ranking position regarding the championship stage. Thus, predicting the final result can be considered much less probable than predicting specific phases results, as the seeding process in judo results in theoretically less balanced confrontations in the initial phases and more balanced matches in the bronze medal and final disputes.

The current approach used in the present study allowed us to control for this intervenient variable (i.e., competition phase) and to provide specific information for them. For instance, our findings revealed a greater equality during preliminary phases in male championships. In turn, in female competitions, higher-ranked athletes were more likely to pass the eliminatory stage. A higher imbalance during the initial phases can be expected given the seeding process (i.e., the higher-ranked athletes compete against the lower-ranked), which intends that the best athletes do not meet until later in the competition. This system however has been questioned given the high costs required in maintaining a top rank position (training periodization, travels, weight loss, and high injury risk) to obtain an apparent low advantage (~41% winning chances) against no-seeded judo athletes in the last two Olympic Games editions (Guilheiro & Franchini, 2017).

Regarding the further phases, semi-final and quarters stated, in overall, as the most favourable to higher-ranked athletes. Probably one can speculate that some low-ranked athletes reached these stages unexpectedly and, therefore, competing against a higher-level athlete, which may reduce the winning chance (Gómez et al., 2013). Furthermore, a greater technical-tactical skills (Franchini, Sterkowicz, Meira, Gomes, & Tani, 2008), physical fitness (Franchini, Takito, Kiss, & Sterkowicz, 2005) and high-level competitive experience can be expected from the higher-ranked athletes (Courel, Franchini, Femia, Stankovic, & Escobar-Molina, 2014; Franchini et al., 2005). Moreover, the specific differences between sexes can be related to the lower number of female compared to male judo athletes. Thus, as the number of participants in many females' judo competitions is reduced, reaching the semi-finals and finals involves a smaller number of matches won than for males (Julio, Panissa, Miarka, Takito, & Franchini, 2013). Nonetheless, we are unable to provide solid data explaining these findings. Thus, further investigations are needed to identify those parameters that can importantly alter judo athletes' performance along the championship.

This investigation has some limitations that should be noted. Although the current results came from over 600 combats, this large sample was importantly reduced throughout the championship phases (e.g., from > 60 combats in eliminatory to eight in the finals). Hence, the data should be interpreted with caution. Furthermore, future investigations should explore the existence of ranking influence at international level performance (e.g., World Championship or European Championship), due to the expected differences in competitiveness. Despite these limitations, this study provides the first report made in judo about the potential advantage provided by a better ranking position regarding specific phases along the entire championship.

5. Conclusions

The ranking position has a direct influence on Spanish judo performance, being a solid predictor of final combat outcome. Overall, high-ranked athletes have more options for winning and passing to the next stage. This advantage appears to be greater at the initial phases in females but mitigated as the championship progresses. Interestingly, the quarterfinal appears to be a critical phase in which better skilled and prepared athletes are likely to win. These results fuel the debate about the seeding process in judo championships. Furthermore, we observed for the first time differences according to age and sex groups. Specifically, in females, ranking position seems to have crucial influences on the likelihood of winning. Greater differences between better and lower-ranked were found in Junior female, especially at eliminatory and quarterfinals stages. On the contrary, the Junior male contest appears to be the most equitable competition. In light of these differences, it seems that female competitions are most influenced by the seeding process, while there is a higher equality in males until quarterfinal.

References

Breviglieri, P. V, Possa, M. E. S., Campos, V. M., Humberstone, C., & Franchini, E. (2018). Judo world ranking lists and performance during cadet, junior and senior World Championships. *Ido Movement for Culture. Journal of Martial Arts Anthropology*, *18*(2), 48–53. doi: 10.14589/ido.18.2.7

Brown, M. B., & Forsythe, A. B. (1974). Robust tests for the equality of variances. *Journal of the American Statistical Association*, *69*(346), 364–367.

Courel-Ibáñez, J., & Sánchez-Alcaraz, B. J. (2017). Efecto de las variables situacionales sobre los puntos en jugadores de pádel de élite. *Apunts Educación Física y Deportes*, *127*(1), 68–74. doi: 10.5672/apunts.2014-0983.es.(2017/1).127.07

Courel, J., Franchini, E., Femia, P., Stankovic, N., & Escobar-Molina, R. (2014). Effects of kumi-kata grip laterality and throwing side on attack effectiveness and combat result in elite judo athletes. International *Journal of Performance Analysis in Sport*, *14*(1), 138–147. doi: 10.1080/24748668.2014.11868709

Daniel, L. F., & Daniel, R. (2013). Study regarding the prediction of medal winning in Olympic Games judo competitions. *Journal of Physical Education and Sport*, *13*(3), 386–390. doi: 10.7752/jpes.2013.03062

Drust, B. (2010). Performance analysis research: meeting the challenge. *Journal of Sports Sciences*, *28*(9), 921–922. doi: 10.1080/02640411003740769

Franchini, E., & Julio, U. F. (2015). The judo World Ranking List and the performances in the 2012 London Olympics. *Asian Journal of Sports Medicine*, *6*(3). doi: 10.5812/asjsm.24045

Franchini, E., Sterkowicz, S., Meira, C. M. J., Gomes, F. R. F., & Tani, G. (2008). Technical variation in a sample of high level judo players. *Perceptual and Motor Skills*, *106*(3), 859–869. doi: 10.2466/PMS.106.3.859-869

Franchini, E., Takito, M. Y., Kiss, M. A. P. D. M., & Sterkowicz, S. (2005). Physical fitness and anthropometrical differences between elite and non-elite judo players. *Biology of Sport*, *22*(4), 315–328.

Glazier, P. S. (2010). Game, set and match? Substantive issues and future directions in performance analysis. *Sports Medicine*, *40*(8), 625–634. doi: 10.2165/11534970-000000000-00000

Gómez, M. Á., DelaSerna, A., Lupo, C., & Sampaio, J. (2014). Effects of situational variables and starting quarter score in the outcome of elite women's water polo game quarters. *International Journal of Performance Analysis in Sport*, *14*(1), 73–83. doi: 10.1519/JSC.0000000000000234

Gómez, M. Á., Lago, C., & Pollard, R. (2013). Situational variables. In T. McGarry, P. O'Donoghue, & J. Sampaio (Eds.), *Routledge handbook of sports performance analysis* (pp. 259–269). London: Routledge.

Grubbs, F. E., & Beck, G. (1972). Extension of sample sizes and percentage points for significance tests of outlying observations. *Technometrics*, *14*(4), 847–854. doi: 10.1080/00401706.1972.10488981

Guilheiro, L. M., & Franchini, E. (2017). Be seeded or not be seeded? A study with Olympic judo athletes. *Journal of Exercise Rehabilitation*, *13*(2), 148–152. doi: 10.12965/jer.1734904.452

Julio, U. F., Panissa, V. L. G., Miarka, B., Takito, M. Y., & Franchini, E. (2013). Home advantage in judo: A study of the world ranking list. *Journal of Sports Sciences*, *31*(2), 212–218. doi: 10.1080/02640414.2012.725855

Julio, U. F., Takito, M. Y., Mazzei, L., Miarka, B., Sterkowicz, S., & Franchini, E. (2011). Tracking 10-year competitive winning performance of judo athletes across age groups. *Perceptual and Motor Skills*, *113*(1), 139–149. doi: 10.2466/05.10.11.PMS.113.4.139-149

Lago-Peñas, C., Gómez, M. Á., Megías-Navarro, D., & Pollard, R. (2016). Home advantage in football: examining the effect of scoring first on match outcome in the five major European leagues. *International Journal of Performance Analysis in Sport*, *16*(2), 411–421. doi: 10.1080/24748668.2016.11868897

Marcelino, R., Mesquita, I., & Sampaio, J. (2011). Effects of quality of opposition and match status on technical and tactical performances in elite volleyball. *Journal of Sports Sciences*, *29*(7), 733–741. doi: 10.1080/02640414.2011.552516

McGarry, T. (2009). Applied and theoretical perspectives of performance analysis in sport: Scientific issues and challenges. *International Journal of Performance Analysis in Sport*, *9*(1), 128–140. doi: 10.1080/24748668.2009.11868469

O'Donoghue, P. (2015). *An introduction to performance analysis of sport*. London and New York: Routledge Taylor & Francis Group. doi: 10.4324/9781315816340

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