El mohtaref journal of sports Science.Social And Human Science

vol (09) N° (03) (2022)
p 446–456

Search information

Received 27/02/2022
Accepted:18/06/2022

Printed ISSN: 2352-989X
Online ISSN: 2602-6856

The effect of a 6-week repeated-sprint-ability (RSA) training method on aerobic performance of judokas

Chalouche Mouatez Billah[1*] Kharoubi Mohamed Faycel[2] Benchetioui Abderrazek[3]

[1] University of Algiers3- Laboratory of sciences and techniques of physical and sports activity STAPS (Algeria), chalouche.mouatezbillah@univ-alger3.dz

[2] University of Algiers3- laboratory of motor performance sciences and pedagogical interventions (Algeria), kharoubi14@hotmail.fr

[3] University of Algiers3- laboratory of motor performance sciences and pedagogical interventions (Algeria), a.benchetioui@yahoo.com

ABSTRACT

The purpose of this study was to investigate the effect of a 6-week repeated-sprint-ability exercises training method on aerobic performance of judokas, for this intention we used an experimental method on 10 male judokas (n=10; Age 19,4 ± 1,5 years, weight 65,7 ± 7,6 Kg) from Jeunesse Sportive Madinat Jijel judo club for a 6-week training plan, and for data collection we used two (2) physical tests : rectangular Cooper's 12 minutes run test and triangular luc-leger's bip test.

In the light of the results, there was a significant difference between both pre and posttests on both Cooper's and Luc-Leger's Tests, so we concluded that there's an effect on aerobic performance using repeated-sprint ability training method for male judokas.

Keywords: Judokas, RSA (repeated-sprint-ability), aerobic performance

* *Chalouche Mouatez Billah*

1. INTRODUCTION

Judo is characterized by high-intensity actions (e.g., attacks, defensive actions and counter-attacks, in both standing and ground positions), interspersed with low-intensity actions (e.g., displacement without contact) or pause (e.g., referee stoppage), resulting in an intermittent activity. (Franchini, 2021), official matches present sequences of 20–30 seconds of a combat situation with 5–10 seconds of pause. The contests may have duration times of a few seconds to some minutes, with the match ending when one of the opponents scores with a decisive technique (ippon), scores more points (waza-ari) in four minutes of regular time, or through a golden score in supplementary time. (Uchoa & Al, 2021), and due to the recent rules changes. These changes included decreased pause durations and frequencies and increased active phases. These changes have led to a need for reevaluation of performance adaptations and aerobic and anaerobic needs of the judo athletes. (Ceylan, 2018), thus, to achieve success in judo, athletes need to develop both aerobic and anaerobic pathways to cope with the demands of the action during the matches. (Franchini, 2021)

However, the effective fight carried out by judo players depends on the aerobic energy systems. The aerobic metabolism contributes to faster restoration of high-energy substrates and delayed accumulation of metabolites in the periods of breaks between attacks as well as for the faster recovery from the consecutive matches, therefore, the aerobic capacity is considered as a prerequisite for high training and competitive performance of judo contestants (Dimitrova & Al, 2020), which provides a faster recovery action throughout the match and between successive matches in a competition (Da Silva & Al, 2021)

A study by Ahmaidi et al. (1999) showed that, during three minutes of combat, the energy expenditure of aerobic origin represents values of the order of 28.5% (14.79 ± 5.05 ml.kg-1.min-1), 68% (35.39 ±12.85 ml.kg-1.min-1) and 78.3% (40.73 ± 4.05 ml.kg-1.min-1) of VO2max (52 ± 5.30 ml.kg-1.min-1) during the 1st, 2nd and 3rd minutes of combat. (Ahmaidi & Al, 1999), these data clearly show the high level of aerobic stress during a three-minute fight, which explains why athletes with a "tough" profile prefer to make fights last and impose a sustained pace. (Paillard, 2014, pp. 76-77)

A judoka's endurance can be defined as the ability to use in a stable physiological state the highest possible percentage of his maximum oxygen consumption (VO2max) during the total duration of all the fights to be carried out. (Paillard, 2014, pp. 92-93), and therefore, it’s the ability to perform an

activity of a given intensity for a certain period of time without decreasing efficiency, (Carrio, 2006) the functional abilities of judokas suggest that there is a connection between aerobic capacity and the speed of recovery after high intensity intermittent activity. Judokas with high aerobic capacity are able to withstand sub maximal activity levels with a more reduced sense of exertion than judokas with lower aerobic capacity, In addition, high aerobic capacity allows a judoka to preserve glycogen, which delays the onset of fatigue during combat and accelerates the recovery from an anaerobic effort. (Stankovic & Al, 2019)

In this context, aerobic power has been considered the main characteristics to be developed by judo players, many training protocols and methods are applied to achieve the well-developed physical conditioning required. In general, judo athletes prepare using generalized training methods, such as running, cycling. (Da Silva & Al, 2021),but particular attention has been paid to the development of training strategies intended to improve performance- related physical qualities (Boussadia & Al, 2021)

Numerous studies have shown that repeated-sprint-ability training strategy which is the ability to produce the best possible average sprint performance over a series of sprints, separated by short (< 60 seconds) recovery periods, (Bishop & Al, 2011), could be considered as an appropriate training strategy to improve aerobic performances, it should be noted that RST (repeated-sprint-training) is a time efficient training strategy for enhancing aerobic power, given to the lower volume session required by RST when compared to other high-intensity aerobic interval trainings, in fact, studies have demonstrated that, repeated sprint training is effective in conditioning neuromuscular quality-related abilities of short sprint speed, jump, and aerobic fitness. (Gantois & Al, Repeated Sprint Training improves both anaerobic and aerobic fitness in basketball players, 2019), from these studies we quote, (Tønnessen & Al, 2011) , (Kaynak & Al, 2017)

On the other hand, the amount of research concerning RSA training methods in individual sports or martial arts is modest.

In light of the above, the present study aimed to determine whether there is an effect of repeated-sprint-ability training protocol on aerobic performances of judokas, we hypothesized that RSA training method affects aerobic performance of judokas.

2. Methods and materials:

2.1. Subjects:

We took 1 sample composed of 10 judokas that represents both experimental and control group.

10 male judokas (Age 19,4 ± 1,5 years, weight 65,7 ± 7,6 Kg) took part in this study, all subjects trains 5 times a week and 10 hours a week of training, they all have a training experience of 10 ± 2,28 years and competing regularly (at least five years of competition) at national level and international for some of them.

Physical tests and measurements were done 2 days before the start of the training plan; weight was measured with a standard scale.

Testing occurred at the same time of day (5 pm)

Table 1 : represents means and standard deviations of participants characteristics (Age, weight, experience)

	N	Minimum	Maximum	Mean	Standard. Deviation
Age	10	17,00	21,00	19,5000	1,26930
Weight	10	55,00	75,90	65,7300	7,59694
Experience	10	7,00	15,00	10,9000	2,28279

Source : designed by Chalouche Mouatez Billah (researcher)

Table 2 : represents Kolmogorov-Smirnov's Test of normality

	df	Sig.
Weight	10	0,200
Age	10	0,069
Luc-Leger Pre-test	10	0,200
Cooper Pre-test	10	0,171

Source : Designed by Chalouche Mouatez Billah (researcher)

Throught table (2) we note that for the weight of the subjects we have a Significance value of 0,200 which is higher than 0,05, in this case it is safe accept the null hypothesis that there is no statistically significant difference

between weight and the normal distribution, we would presume that the weight is normally distributed.

For Age, we have a significance value of 0,069 which is greater than 0,05 in this case it is safe to accept the null hypothesis that there is no statistically significant difference between Age and the normal distribution, in which we presume that the age is normally distributed.

For Luc-Leger's Pre-test, we have a significance value of 0,200 which is greater than 0,05 it is safe to accept the null hypothesis that there is no statistically significant difference between Pre-test and normal distribution, in which we presume that Luc-Leger's Pre-test is normally distributed.

For Cooper's Pre-test, we have a significance value of 0,171 which is greater than 0,05 it is safe to accept the null hypothesis that there is no statistically significant difference between Pre-test and normal distribution, in which we presume that Cooper's Pre-test is normally distributed.

2.2. Experimental procedure:

The experimental protocol was composed of 2 physical tests that included, rectangular cooper's 12 minutes running test (cooper 1968) and triangular Luc-Leger's Bip test (luc-leger 1983)

Subjects performed both tests in the same day with 20 minutes interval in-between for rest.

Luc-Leger's bip test

The 20-m shuttle race test consists of running without stopping by making back and forth movements on a 20-m course, the test is of the maximum and progressive type: the subjects run as long as possible until that they can no longer follow the imposed speed, which starts at 8.5 km.h-1 and increases by 0.5 km.h-1 every minute.

A magnetic tape serves as an audio-visual support for the 20-m shuttle test, with each sound signal the subject must simultaneously reach one end of the 20-m path, a lead or a lag of 1 or 2 m are tolerated. No turns are allowed, the change of direction is accomplished by a stop followed by a departure. (Leger & Al, 1984)

Cooper's 12 minute running test

Subjects were instructed to complete as many laps as possible on an outdoor track during the 12-minute test period. Emphasis was placed on pacing oneself

throughout the duration of the test. The test administrator counted the laps completed during the 12-minute test period, while calling out the time elapsed at 3, 6, and 9 minutes and verbally encouraging the subjects. At the end of the 12-minute period, the test administrator called to the subjects to "stop," and a measuring wheel was used to determine the fraction of the last lap completed by each subject. This distance was added to the distance determined by the number of laps completed to give the total distance covered during the test. Cooper's standardized equation was then used to convert the distance run to an estimate of Vo2max. (Penry & Al, 2011)

RSA training method protocol:

The RSA training plan consisted of a 6-week training plan, in-which subjects performed the protocol 2-times a week for a total of 12 training sessions.

The training sessions consisted of a 20 minutes general warm-up including running and running ABC's, then followed by repeated-sprint exercises (RSE), which included sets of 15/20/40 meter sprints interspersed by different times of rest that varies from 15 to 30 seconds.

2.3. Statistical analysis:

All data are expressed as mean and standard deviation and T-test for paired-samples was used to examine differences in participant's physical data between pre and post-tests, all statistical analyses were performed using IBM SPSS statistics program for windows version 24.

The t-test can be used, for example, to determine if the means of two sets of data (pre and post-test) are significantly different from each other.

3. Results:

Table 3 : Represents the results of subjects regarding Cooper's pre and post-test

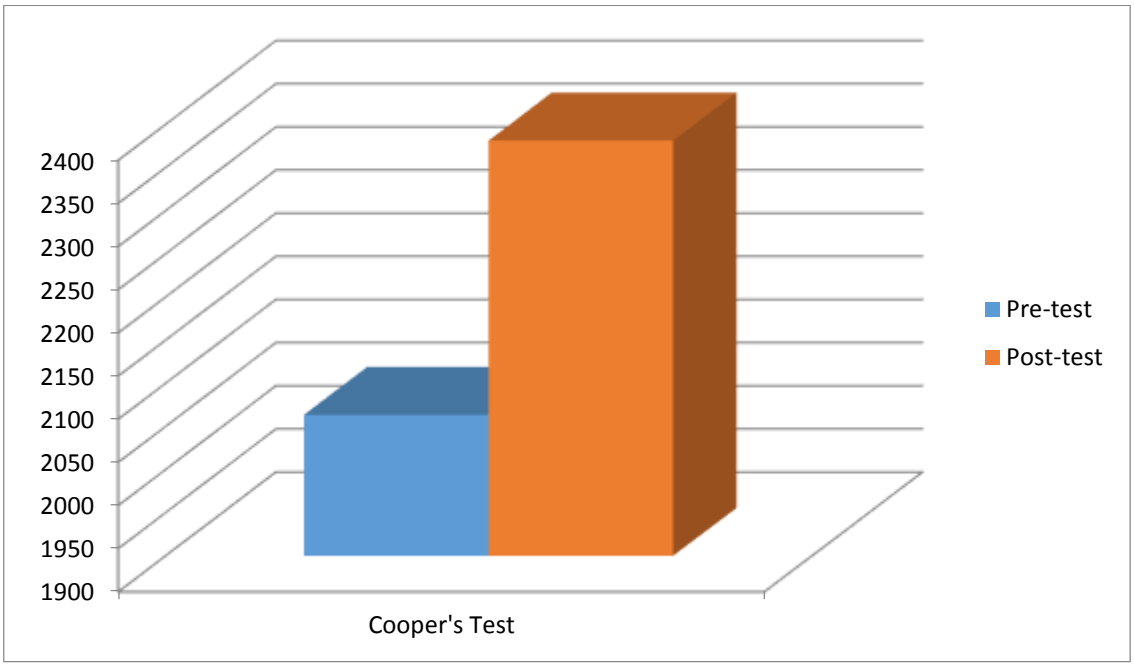
Distance travelled	N	Mean	S.Deviation	T Tabular	T Calculated
Cooper's PreTest	10	2063,400	282,69	2.262	5,358
Cooper's PostTest	10	2381,200	278,83		

Source : Designed by Chalouche Mouatez Billah (researcher)

Throught table (2) which represents the results of subjects regarding Cooper's pre and post-test, we have noted that subjects have travelled a distance of 2063,4 ± 282,69 meter during the pre-test and 2381,2 ± 278,83 meter during the post-test, the calculated T-value between the pre and post-test is 5,358

Using the degree of freedom value as 9 and a 5% level of significance, a look at the t-value distribution table gives a value of 2,262. Comparing this value against the calculated value of 5,358 indicates that the calculated t-value is greater than the table value at a significance level of 5%. Therefore, it is safe to reject the null hypothesis that there is no difference between means and there for, it favors the alternative hypothesis that there is a statistical difference between means.

Figure 1: Represents the results of subjects regarding cooper's pre and post-test



Source : Designed by Chalouche Mouatez Billah (researcher)

Table 4 : Represents the results of subjects regarding Luc-leger's pre and post-test

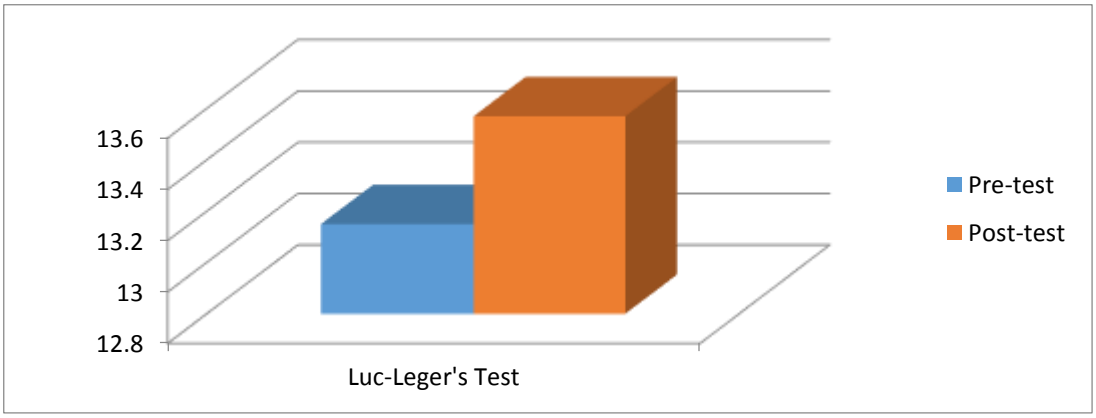
Maximal Aerobic Speed	N	Mean	S.Deviation	T Tabular	T Calculated
Luc-Leger's PreTest	10	13,150	0,6258	2.262	4,996
Luc-Leger's PostTest	10	13,570	0,6583		

Source : Designed by Chalouche Mouatez Billah (researcher)

Throught table (3) which represents the results of subjects regarding Luc-Leger's pre and post-test, we have noted that subjects have scored a MAS (maximal Aerobic Speed) of 13,15 ± 0,62 Km/h during the pre-test and 13,57 ± 0,65 Km/h during the post-test, the calculated T-value between the pre and post-test is 4,996.

Using the degree of freedom value as 9 and a 5% level of significance, a look at the t-value distribution table gives a value of 2,262. Comparing this value against the calculated value of 4,996 indicates that the calculated t-value is greater than the table value at a significance level of 5%. Therefore, it is safe to reject the null hypothesis that there is no difference between means and there for, it favors the alternative hypothesis that there is a statistical difference between means.

Figure 2: Represents the results of subjects regarding Luc-leger's pre and post-test



Source : Designed by Chalouche Mouatez Billah (researcher)

4. Discussion

The primary novel finding from the present study was that a 6-weeks of RSA (Repeated-Sprint-ability) training method combined with traditional Judo training significantly increased aerobic performance of judokas.

We found an increase in Cooper's 12 minutes test distance travelled score (Posttest 2381,2 ± 278,8 meter compared to pretest's 2063,4 ± 282,7 meter), and Luc-Leger-bip test MAS (Maximal aerobic speed) score (13,570 ± 0,6 Km/h of posttest compared to 13,150 ± 0,6 Km/h of pretest), and that is an increase of 15,4% and 3,2% for Cooper's test and Luc-Leger' test respectively.

Our results confirms those of Gantois & Al (2019) study of repeated sprint training improves both anaerobic and aerobic fitness in basketball players, since it concluded that, repeated sprint training is effective in conditioning neuromuscular quality-related abilities of short sprint speed, jump, and aerobic fitness in college basketball players. (Gantois & Al, Repeated Sprint Training improves both anaerobic and aerobic fitness in basketball players, 2019)

And those of Kanyak & Al (2017) study of the effects of 20-m repeated sprint training on aerobic capacity in college volleyball players that indicates that the addition of a repeated sprint training program can improve both the aerobic capacity and anaerobic performance of college volleyball players. (Kaynak & Al, 2017)

Another study of Gantois & Al (2017) strongly confirms our study results and indicates that the ability to perform repeated sprints involves a significant participation of the anaerobic metabolism, primarily in the initial efforts, whereas as the efforts are repeated, a greater contribution of the aerobic fitness is observed. (Gantois & Al , Repeated sprints and the relationship with anaerobic and aerobic fitness of basketball athletes, 2017)

Same with Sanders & Al (2017) of Aerobic Capacity is Related to Repeated Sprint Ability with Sprint Distances Less Than 40 Meters, which its results were that aerobic fitness is associated with faster sprint times during a more anaerobic RSA test when sprint distances are less than 40 meters. (Sanders & Al, 2017)

Study of Thébault & Al (2011) of Repeated-Sprint Ability and Aerobic Fitness, goes strong with our study's results since it was found that subjects with greater MAS were able to maintain almost constant level of speed throughout series of repeated sprints and achieved better recovery between series. A MAS of at least

17 km-h favors constant and high speed level during repeated sprints. From a practical point of view، a high aerobic fitness is a precious asset in counteracting fatigue in sports with numerous sprint repetitions. (Thébault & Al, 2011)

But not much of Tonnessen & Al (2011) study of effect of 40-m repeated sprint training on maximum sprinting speed, repeated sprint speed endurance, vertical jump, and aerobic capacity in young elite male soccer players, since its results indicates that a weekly training with repeated sprint gave a moderate but not statistically marked improvement in 40-m sprinting, CMJ, and beep test, but nonetheless, there's a slight improvement. (Tønnessen & Al, 2011)

But Castagna & Al (2013) study of the relation between maximal aerobic power and the ability to repeat sprints in young basketball players, did not confirm our study since it reported that VO2peak is not a predictor of repeated-sprint ability in young basketball players. The high blood lactate concentrations found at the end of the repeated-sprint ability protocol suggest its use for building lactate tolerance in conditioned basketball players. (Castagna & Al , 2013)

5. CONCLUSION

The purpose of this study was to investigate the effect of a 6-week repeated-sprint-ability exercises training method on aerobic performance of judokas, and from our modest results we found that using repeated-sprint ability training method that consists of intervals sprints of 15/20/30 meter interspersed with rest periods of 15/30 seconds have a benefic effect on MAS (Maximal Aerobic Speed) which is a part of aerobic performance and therefor it has an effect on aerobic performance.

Bibliography

Ahmaidi & Al, S. (1999). Oxygen uptake and cardiorespiratory responses during selected fighting techniques in judo and kendo. Research in Sports Medicine, 129-139.

Bishop & Al, D. (2011). Repeated-Sprint Ability Part II : Recommendations for Training. Sports medicine (Auckland.N.Z), 41(10), 742-756.

Boussadia & Al, Y. (2021). The effects of the plyometric program on the physical quality of the Repeated Sprit Ability (RSA) in senior handball players. The excellence Journal in Sciences techniques of physical activity and sports, 06 N° 02, 807-825.

Carrio, C. (2006). Sport de combat : Préparation physique. France: Amphora.

Castagna & Al , C. (2013). Relation between maximal aerobic power and the ability to repeat sprints in young basketball players. Journal of Strength and Conditioning Research, 21(10), 1172.

Ceylan, B. (2018). The comparison of Judo-Specific Tests. Ido Movement for culture.

Da Silva & Al, L. (2021). Training Protocols and specific performance in Judo Athletes. Journal of Strength and Conditioning Research.

Dimitrova & Al, D. (2020). Aerobic capacity of Judo players scaled for differences in body size. Journal of applied sports Sciences, 23.

Franchini, E. (2021). High-intensity interval training in judo uchi komi : fundamentals and practival recommendations. The Arts and Sciences of Judo, 35-45.

Gantois & Al , P. (2017). Repeated sprints and the relationship with anaerobic and aerobic fitness of basketball athletes. Journal of Physical Education and Sport, 17.910(10.7752).

Gantois & Al, P. (2019). Repeated Sprint Training improves both anaerobic and aerobic fitness in basketball players. Isokinetics and Exercise Science.

Kaynak & Al, K. (2017). The effects of 20-m repeated sprint training on aerobic capacity in college volleyball players. Biomedical Human Kinetics.

Leger & Al, L. (1984). Aerobic capacity of 6 to 17-year-old Quebecois-20 meter shuttle run test with 1 minute stages. Canadian journal of applied sport sciences, 66.

Paillard, T. (2014). Optimisation de la performance sportive en judo. Bruxelles, Belgium: De Boeck.

Penry & Al, J. (2011). Validity and Reliability analysis of Cooper's 12-minute run and the multistage shuttle run in healthy adults. Journal of strength and conditioning research, 25 (3), 597-605.

Sanders & Al, G. (2017). Aerobic Capacity is Related to Repeated Sprint Ability with Sprint Distances Less Than 40 Meters. International Journal of Exercise Science, 10, 197-204.

Stankovic & Al, N. (2019). Correlation between body composition and functional abilities of Judokas selected for the National Team. Physical Education and Sport through the centuries, 6.

Thébault & Al, N. (2011, October). Repeated-Sprint Ability and Aerobic Fitness. Journal of Strength and Conditioning Research, 25(10), 2857-2865.

Tønnessen & Al, E. (2011). The effect of 40-m Repeated Sprint Training on maximum Sprinting Speed, Repeated Sprint Speed Endurance, Vertical Jump, and Aerobic capacity in Young elite male soccer players. Journal of strength and conditioning research / National Strength & conditioning Association.

Uchoa & Al, F. (2021). Effect of Uchi-Komi prescribed as high interval training on Judo athletes. Revista Andaluza de Medicina del Deporte.