Comparing the Effect of Interval and Continuous Small-Sided Games on the Bio-Motor Abilities of Young Soccer Players

Farhad Daryanoosh  
Shiraz University

Hossein Alishavandi  
Shiraz University

Javad Nemati  
Shiraz University

Aref Basereh  
Kharazmi University

Alireza Jowhari  
Shiraz University

Enyatollah Asad-manesh  
Shiraz University

Rafael Oliveira  
Sports Science School of Rio Maior - Polytechnic Institute of Santarém

João Paulo Brito  
Sports Science School of Rio Maior - Polytechnic Institute of Santarém

Pablo Prieto-González  
Prince Sultan University

Kayvan Khoramipour  
Kerman University of Medical Sciences

Tomás García-Calvo  
University of Extremadura

Hadi Nobari  (✉️ hadi.nobari1@gmail.com )  
Transilvania University of Braşov

Research Article

**Keywords:** Football, body composition, physical fitness, aerobic power, anaerobic power, youth players

**Posted Date:** January 11th, 2023

**DOI:** https://doi.org/10.21203/rs.3.rs-2450113/v1
Abstract

Objective: This study aimed to compare the effect of interval and continuous small-sided games (SSG) training on the bio-motor abilities of young soccer players.

Methods: Sixteen young soccer players (age: 19.5±0.5 years; height: 177±4.72) were ranked based on the result of a running-based anaerobic sprint test (RAST) and randomly divided into two groups; continuous SSG training (CSSG, n = 8) and interval SSG (ISSG, n = 8). The training protocols were performed for eight weeks, three sessions per week. Participants were assessed twice (pre- and post-intervention) to estimate their anaerobic capacity with the RAST, aerobic capacity with Yo-Yo intermittent recovery test, body fat percentage with a bioimpedance analysis, speed with a 30-meter run test, and agility with the Illinois agility test. During the training session, the rating of the perceived exertion (RPE) and heart rate (mean and maximum) were recorded to assess the training load.

Results: In general, both aerobic and anaerobic capacities improved after ISSG (p<0.05, for all). The between-group analysis with repeated measures ANOVA revealed that there were higher values for ISSG than CSSG groups in the post-intervention in anaerobic power (p=0.042, \( \eta^2=0.264 \)). In addition, the independent t-test results indicated that ISSG presented lower values of mean heart rate (p=0.023, effect size [ES]=0.85) and RPE (p<0.05, ES=0.88) than CSSG. Moreover, higher values for maximum heart rate were revealed for ISSG than for the CSSG group (p=0.004, ES=0.85).

Conclusion: We conclude that ISSG could provide better results in the anaerobic power than CSSG.

Introduction

Small-sided Games (SSG) is a type of training, which is performed on smaller pitches, using modified rules with fewer players than traditional [1]. Currently, contradictory findings are available on how these exercises can be used to optimally improve the physical capacity and technical/tactical skills of soccer players [2]. Nonetheless, a recent umbrella review of systematic reviews and meta-analyses about SSG reported several acute and chronic effects in tactical, technical, and physical dimensions which consequently to contribute for higher levels of physical fitness [3].

Several variables can affect the intensity of training during the SSG such as: the number of players; the pitch configuration (individual area by player and size of the field); if there any specific rule of scoring a goal or not; using goalkeepers/jokers or not; the number of actions allowed; and the number of repetitions, sets, and ratio of effort/rest. The assumption that SSG simulate workloads, physiological loads, and intensities appropriate to the actual game, as well as developing technical and tactical skills, has led to their popularity among soccer coaches. From a practical point of view, practicing with regular ball engagement may improve a soccer player's performance more than any other method. SSG training can technically and physically create a match-like environment for players, with SSG recommending a maximum heart rate of 90 to 95% to improve and maintain cardiovascular fitness [4]. Therefore, SSG seem to produce similar effectiveness to traditional (analytical) methods of running-based
cardiorespiratory training to develop players' physical fitness [5]. In this way, SSG take advantage of greater and better motivation, motor efficiency, tactical concentration, and technical ability of soccer athletes. However, the manipulation constrained game-based drills can significantly affect the physical and technical performance of the SSG [6]. Additionally, it is also necessary to highlight the greater variability that SSG present in terms of exercise intensity when compared to traditional methods [7].

According to some studies, specific exercises such as soccer training in small areas are preferred to improve aerobic capacity [8–10]. However, due to the contradictory re-search, it is not possible to drive a definite conclusion about SSG and the extent to which they affect physical fitness factors [11]. In a study by Hill-Hass et al. [12], it was reported that continuous SSG (CSSG) training has a higher fatigue index and heart rate than the interval SSG (ISSG) training. Furthermore, a previous systematic review showed that it is not possible to express a definite conclusion about the type of SSG and the extent of its effect on physical fitness factors, due to the different training designs and their adaptations, respectively, as well as the scarce number of studies that used long duration in SSG, which was just one in the present systematic review [13].

Therefore, the present study examines the comparison of the effects of SSG between ISSG and CSSG programs on physical fitness factors of young soccer players. The study hypothesizes that both ISSG and CSSG will enhance the bio-motor abilities of young soccer players.

Materials And Methods

Participants

Sixteen players, aged 19.5±0.5 years, were randomly selected from 8 different national teams from the Iranian Youth League (3rd Division League, Omid) with a playing experience of 3-5 years. The eligibility criteria were as follows: (1) subjects had no injuries, illness, or physical limitations during the study, (2) subjects completed at least 80% of the total sessions, and (3) subjects completed all of the test procedures (pre-post).

Study design

This study followed a randomized parallel study design. After selecting the participants, all athletes were invited to the Shiraz University and a detailed explanation of the research procedure was provided for them. Then, they completed and signed the consent form. Before starting the training procedure, all participants were tested for Yo-Yo, Running-Based Anaerobic Sprint Test (RAST), Illinois agility, 30-meter speed, and body com-position (body fat percentage). After that, the participants were ranked based on the result of RAST test. Then they were divided into two groups (N=8 in each group) of ISSG and CSSG using match design. Each group performed specific training protocols for 8 weeks in the pre-season period, 3 sessions per week (Table 1). After the end of 8 week-training protocols, the same tests were repeated. It
should be noted that this study was conducted during pre-season when the players did not participate in any other training program rather than the training protocol of this study.

(INSERT TABLE 1 OVER HERE)

For both CSSG and ISSG, the following characteristics were applied: field with 40x20 meters, four against four players, two turnovers were one point in favor of the opponent team, only two touches on the ball were allowed, spacing was encouraged by the re-searchers, the opposing team was trying to take the ball, each team that exchanged ten consecutive passes also scored one point. Moreover, there was no predetermined intensity, and the players were free to do their best to win. The tests and training protocols were conducted on the artificial grass field of Shiraz University during the players' pre-season, from June to September 2018.

Measurements

*Heart rate:* mean heart rate (HR_{mean}) and HR maximal (HR_{max}) were collected using a POLAR watch (H-10, USA) participants' heart were measured during each session.

*Rate of perceived exertion (RPE):* using Borg [14] scale in all training sessions and each test. This scale is designed from 6 to 20. The number 6 indicates “very, very light” and the number 20 indicates “very, very strong (almost maximal)”.

*Anaerobic power:* The RAST is a six by 35-m dis-continuous sprint to measure an-aerobic power. Each sprint represents a maximal effort with 10 seconds allowed between each sprint for turnaround. The time for each run was measured by two photocells and the start for each sprint (10-second interval) occurred with a beep from the photocell equipment. The athlete must sprint at maximum speed through the line each time. The next sprint starts from the opposite end of the measured track. The time between each run is designed to allow the athlete to return to the start line after running through the line, to record the time and reset the watch. At the end of the test the coach will have six times which can be used, along with body weight, to calculate maximal, minimal and average power outputs along with a fatigue index as follow [15,16]:

\[
\text{Power} = \text{Body Mass} \times \text{Distance}^2 \div \text{Time}^3
\]

Maximum power - the highest value

Minimum power - the lowest value

Average power - the sum of all six values \(\div 6\)

Fatigue Index - (Maximum power - Minimum power) \(\div\) Total time for the 6 sprints
For calculating maximum power, the lowest time, minimum power, the highest time and mean power, the mean of 6 intervals were used.

**Aerobic power:** The Yo-Yo intermittent recovery test level 1 consists of repeated 2 × 20-m runs back and forth between the starting, turning, and finishing line at a progressively increased speed controlled by audio bleeps from a tape recorder and it was used to measure anaerobic power. Between each running bout, the subjects have a 10-s active rest period, consisting of 2 × 5-m of jogging. When the subjects twice have failed to reach the finishing line in time, the distance covered is recorded and represents the test result. The test consisted of 4 running bouts at 10–13 km·h⁻¹ (0 –160-m) and another 7 runs at 13.5–14 km·h⁻¹ (160 – 440-m), where after it continues with stepwise 0.5 km·h⁻¹ speed increments after every 8 running bouts (i.e., after 760, 1080, 1400, 1720 m, etc.) until exhaustion. The test was performed indoor on running lanes, marked by cones, having a width of 2-m and a length of 20-m. Another cone placed 5-m behind the finishing line marked the running distance during the active recovery period. Before the test, all subjects carried out a warm-up period consisting of the first four running bouts in the test [17,18].

After the test, the maximum oxygen consumption (VO₂max) was calculated using the following formula [19]:

\[
\text{VO₂max (ml·min⁻¹·kg⁻¹)} = \text{distance run} \times 0.0136 + 45.3
\]

**Speed:** A 30-meter speed test was used to measure the players' speed. Each subject ran the 30-meter route for three times at a maximum speed, and the best time of each player was recorded [20].

**Agility:** The Illinois agility test was used to measure agility. Individuals traveled at a maximum speed similar to the route drawn, and the time was recorded [21]. The length of the course was 10-m and the width was 5-m. Four cones were used to mark the start, finish and the two turning points. Another four cones were placed down the center an equal distance apart. Each cone in the center was spaced 3.3-m apart. The player lies in the prone position with his chin touching the surface of the starting line. The first light sensor is placed at the start line, 50-cm above the ground. The light sensor will be activated as the subject moves from the prone position. The second light sensor is placed at the finish line. Timing gates were placed at the start and finish lines at a height of 0.30-m. On the re-searchers “Go” command the stopwatch was started and the participant got up as quickly as possible and ran around the course in the direction indicated while attempting to avoid any contact with the placed cones. He then runs towards the starting line's middle cone, zig-zags through the cones downward and again upwards, sprints to the last cone on the far side and finishes at the finish line. Upon crossing the finish line, the timing was stopped. Subjects performed two maximal attempts at each exercise with at least 2 min rest between tests and trials. The faster time taken and recorded in seconds [22]. This test showed to be valid and reliable in male team sports athletes [23].

**Body composition:** participants body weight and body fat percentage were evaluated using body analyze device (MA601, Taichung City 41262 Taiwan) [24].
Diet: participants’ diet was controlled using food processor nutrition analysis software (PCN software, Cesnida, Spain).

Statistical analysis

Mean and standard deviation (SD) were used to describe data. Then, normality and homogeneity of the data were assessed using Shapiro-Wilk and Levene tests, respectively. Repeated measures ANOVA (2×2) test was used to evaluate the Aerobic and Anaerobic power, Yo-Yo Test, Agility, Speed, Body fat Percentage and Body weight variables in both ISSG and CSSG groups. In addition, an independent t-test was used to compare between groups’ differences in RPE, mean, and maximum heart rate. A p<0.05 was considered significant and partial eta squared was used as effect size where the following thresholds were applied: ηp² = 0.01 indicates a small effect. ηp² = 0.06 indicates a medium effect. ηp² = 0.14 indicates a large effect [25].

Results

Aerobic power

At baseline, there were no differences in aerobic power (VO2max) between groups (p>0.05). The results of the repeated measures ANOVA test related to aerobic power showed that there were no significant differences for a GROUP×TIME interaction (F(1,14)=1.65, p=0.219, ηp²=0.588). However, for TIME, the results showed that VO2max increased from pre to post training in the ISSG and CSSG groups by 6.7% and 4.12%, respectively (F(1,14)=19.94, p=0.001, ηp²=0.106).

Anaerobic power

At baseline, there were no differences in anaerobic power between groups (p > 0.05). The results of the repeated measures ANOVA test related to anaerobic power parameters showed that there was a significant difference for Time (F(1,14)=11.29, p=0.005, ηp²=0.446) and a GROUP×TIME interaction (F(1,14)=5.01, p=0.042, ηp²=0.264). The results of interaction showed that the ISSG group had a significantly greater effect on increasing anaerobic capacity than the CSSG group (p=0.005) (Figure 1).

Yo-Yo Test

At baseline, there were no differences in Yo-Yo test between groups (p > 0.05). The results of the repeated measures ANOVA test related to Yo-Yo test showed that there was no significant difference for a GROUP×TIME interaction (F(1,14)=1.93, p=0.186, ηp²=0.121). However, for TIME, the results showed that of Yo-Yo increased in the ISSG and CSSG groups by 34.5% and 20.8%, respectively, which was significant between groups (F(1,14)=20.43, p<0.001, ηp²=0.893) (Figure 1).
Agility

At baseline, there were no differences in Illinois agility test between groups (p > 0.05). The results of the repeated measures ANOVA test related to Illinois agility test showed that there was no significant difference for TIME (F(1,14)=0.332, p=0.573, $\eta^2_{p}=0.023$) and a GROUP×TIME interaction (F(1,14)=2.69, p=0.123, $\eta^2_{p}=0.161$) (Figure 1).

Speed

At baseline, there were no differences in 30-m test between groups (p>0.05). The results of the repeated measures ANOVA test related to 30-m test showed that there was no significant difference for TIME (F(1,14)=0.316, p=0.583, $\eta^2_{p}=0.022$) and a GROUP×TIME interaction (F(1,14)=1.40, p=0.255, $\eta^2_{p}=0.091$) (Figure 1).

(INSET OVER HERE FIGURE 1)

Body fat Percentage

At baseline, there were no differences in Body fat Percentage between groups (p>0.05). The results of the repeated measures ANOVA test related to Body fat Percentage show that there is a no significant difference for TIME (F(1,14)=4.01, p=0.065, $\eta^2_{p}=0.223$) and a GROUP×TIME interaction (F(1,14)=1.10, p=0.312, $\eta^2_{p}=0.073$) (Figure 2).

Body weight

At baseline, there were no differences in Body weight between groups (p>0.05). The results of the repeated measures ANOVA test related to Body weight showed that there was no significant for Time (F(1,14)=0.903, p=0.358, $\eta^2_{p}=0.061$) and a GROUP×TIME interaction (F(1,14)=0.902, p=0.358, $\eta^2_{p}=0.060$) (Figure 2).

(INSET OVER HERE FIGURE 2)

Mean heart rate

Mean and SD of HR$_{\text{mean}}$ were 162±3.67 in the ISSG group and 168±2.86 beats per minute (bpm) in the CSSG group. The HR$_{\text{mean}}$ in the CSSG group was significantly higher than the ISSG group (t8=2.74, p=0.023, ES=0.85) (Figure 3).

Maximum heart rate
The mean and SD of the HR\textsubscript{max} changes were 193±2.82 in the ISSG group and 184±4.32 bpm in the CSSG group. The HR\textsubscript{max} in the ISSG group was significantly higher than CSSG group (t\_8=3.98, p=0.004, ES=0.85) (Figure 3).

**RPE**

The mean and SD of RPE were 16.37±0.74A.U. In ISSG group and 17.87±0.99A.U. In the CSSG group. RPE was significantly higher in the CSSG group (p=0.024, ES=0.88) (Figure 3).

(INSET OVER HERE FIGURE 3)

**Discussion**

This study aimed to compare the effect of ISSG and CSSG on the bio-motor abilities of young soccer players. Our results showed that aerobic power (i.e., VO\textsubscript{2max} and Yo-Yo), an-aerobic power (RAST) improved in both groups while the results of Illinois, 30-meter, body fat percentage, and body weight did not any improvements. Finally, the intensity measures of HR\textsubscript{mean}, and RPE were lower in ISSG than CSSG while HR\textsubscript{max} was higher in ISSG than CSSG groups.

**Aerobic power**

In the present study, it was found that there is no significant difference between the two groups of ISSG and CSSG in VO\textsubscript{2max} and Yo-Yo test results. However, after comparing the pre-test and post-test in both, it was found that there was a significant increase only in the ISSG training group. A previous research was consistent with the results of the present study [26]. That study compared traditional (running) with SSG training, in which SSG training was performed in form of intervals in 4 sets of 4 minutes with a maximum heart rate of 90 to 95% and 3-minute of recovery between the sets. The results of that study showed that the sub-maximal lactate response and VO\textsubscript{2max} were improved in those players. Also, with the increase of aerobic abilities of the players, their displacement in the game increased by 571 meters [26]. Other study compared ISSG and CSSG (2 vs 2, 3 vs 3 and 4 vs 4) training with 6–12 minutes of duration and found similar physiological responses in both groups, including improvement in VO\textsubscript{2max} [27]. Another study found that SSG (5 vs 5) training performed with 85% of HR, improved aerobic power [28]. How-ever, other research found that SSG training had no effect on participants' aerobic capacity compared to non-ball speed training, but it is important to highlight that floaters were used and could justify the different results [29]. Besides, number of players and the size of the field could also justify the different results when compared with the present study.

**Anaerobic capacity, heart rate, maximum heart rate and RPE**
In the present study, it was found that anaerobic power in the ISSG training group was higher than the CSSG group. Also, after comparing the pre-test and post-test in both groups, it was found that there is a significant increase only in the ISSG training group. On the other hand, the HR\textsubscript{mean} in the CSSG group was significantly higher than the ISSG training. Also, there was a significant increase in the HR\textsubscript{max} in ISSG compared to CSSG. The use of CSSG allowed that players can sustain a higher work rate over time. Despite the higher training volume, the locomotor demands tend to be low which consequently produces lower fatigue [30]. CSSG seems to allows a better recovery for a strength training day which consequently will contribute for better readiness in the following days [31]. Also, this type of training can contribute for improvements in the tactical complexity [5].

In the present study, HR was examined from different aspects. The characteristic of CSSG is to increase HR due to its constant intensity. For this reason, a significantly higher level in HR was observed in the CSSG than the ISSG training which was corroborated by a previous study with the same design [13]. However, in ISSG training, the exercise intensity is constantly variable and in a short time which consequently make HR reaches its maximum and then decreases. Therefore, a significant increase in the HR\textsubscript{mean} was observed in ISSG training group compared to CSSG group. Also, due to the significant increase in the RPE of the CSSG group compared to ISSG group, the same conditions were found in which CSSG appeared to be more intense than ISSG training.

In line with the results of the present study, we can refer to a study where the authors compared the two types of ISSG training (3 of 6-minute attempts with 3 minutes recovery between) and CSSG (an 18-minute effort without recovery). The authors concluded the similar improvements for anaerobic power index, while HR, RPE and blood lactate were also identical in both groups [32]. Other study which also compared CSSG (2 vs 2, 3 vs 3 and 4 vs 4 with duration of 6, 9 and 12 minutes, respectively) training and ISSG (2 vs 2, 3 vs 3 and 4 vs 4 with duration of 2, 3 and 6 minutes, respectively), found a significant improvement in anaerobic power in all three protocols was observed [27]. In another study, the ISSG (4 vs 4 with 3 of 6-minute attempts with varying recovery times between attempts) observed a significant improvement in anaerobic power in the post-test compared to pre-test [33].

There are subtle differences in training programs, age, and player ability in the literature. Based on the research background, it generally seems that the simultaneous increase in the number of players and the size of the field in SSG increases the intensity of training. For example, Rampini et al. examined the effects of a simultaneous increase in the number of players and pitch on HR\textsubscript{max}, blood lactate and RPE in 20 amateur soccer players. The results showed that intensity of training will be followed by an increase in the named variables [26]. On the other hand, found that when the number of players increased, they reported a decrease in the HR\textsubscript{max} percentage. As the number of players decreased, the heart rate increased [11]. In contrast, other studies did not show significant results in HR changes with a decrease in the number of players [27, 34, 35].

Most research suggest that as the size of the field increases, RPE, HR, and lactate concentration increase [36–38]. In a study of the effect of ground dimensions on HR, it was observed that with increasing ground
dimensions, heart rate increased during activity [26, 39]. In contrast, a previous study has not achieved significant results [11]. It was also observed in two studies that with increasing field dimensions, the RPE was higher [26, 39].

Recent studies have shown that different physiological and technical responses are obtained with different numbers of players. With decreasing number of players, heart rate, fatigue index and lactate concentration increase, but technical activities decrease. The relationship between the parameters of small-sided game training and the ratio of players to the size of the field is also important [31].

**Weight and body fat, speed and agility**

In the present study, the changes in weight and body fat percentage of soccer players decreased in both types of training programs, but this decrease was not significant. It seems that the reason for the non-significance of these changes goes back to the initial body weight and the level of physical fitness of these players, and also the insufficient training period (eight weeks) which is in line with previous a previous study that analyzed the effect after a detraining period of four weeks plus a training period of another four weeks [40]. Indeed, another study that showed positive effects but only after 11 weeks [41]. Also, in the variables of speed and agility, the results showed that the speed was not significantly different between the two groups of ISSG and CSSG. An increase in speed was observed in both groups and this increase was greater in the ISSG training group; however, none of the results related to this variable were significant. Also, in the agility, in comparison of pre-test and post-test of each group, it was found that there is no significant difference between them. Among the reasons why speed and agility in soccer players were not significant in this study could be related to the insufficient training period as well as the initial level of physical fitness of the players.

The present study presents some limitations that should be considered to interpret the results: a) the small sample size; b) only 4vs4 SSG were considered for analysis; c) only a short period of eight weeks of the pre-season was analyzed.

Future studies should develop their research with larger sample sizes and larger interventions. Moreover, other number of players should be considered and tested to understand the differences from physical and physiological point of view. Moreover, complementary training such as strength and conditioning sessions should also be included for future analysis.

Nonetheless, the results of this study help coaches and their staff to optimize their training plan and periodization by providing highlights with CSSG and ISSG with total durations between 25 to 40 minutes. Additionally, this study provides relevant information on two possibilities of SSG in different formats (intermittent and continuous) which can be chosen according to the aim and the objectives of the training and the period of the season.

**Conclusion**
In general, the present study shows that ISSG training has a greater effect on improving anaerobic power, but CSSG also improved, although with a lower magnitude. In addition, according to the obtained RPE, HR results, the degree of difficulty of ISSG training is lower than CSSG training.

**Abbreviations**

Not applicable

**Declaration**

**Acknowledgements**

Not applicable

**Funding**

This research was funded by the Portuguese Foundation for Science and Technology, I.P., Grant/Award Number UIDP/04748/2020.

**Availability of data and materials**

The datasets generated during and analyzed during the current study are available from the author F.D and KK. upon reasonable request

**Ethics approval and consent to participate**

All players were notified of the research procedures, requirements, benefits, and risks, and they all signed a written informed consent obtained prior to the study. This study was completed according to the Declaration of Helsinki and adhered to the proposed ethical guidelines of the International Journal of Sport Management. This study was approved by the ethical committee of Shiraz University with number 2018.17.

**Competing interests**

The authors declare that they have no competing interests.

**Consent for publication**

Not applicable

**Authors’ contributions**

K.K., and H.N., writing—review and editing, R.O., J.P.B., P.P.G., K.K., T.G.C., and H.N. All authors have read and agreed to the published version of the manuscript.

Authors’ information

Farhad Daryanoosh¹, Hossein Alishavandi¹, Javad Nemati¹, Aref Basereh², Alireza Jowhari¹, Enayatollah Asad-manesh¹, Rafael Oliveira³,⁴,⁵,*, João Paulo Brito³,⁴,⁵, Pablo Prieto-González⁶, Kayvan Khoramipour⁷, Tomás García-Calvo⁸, and Hadi Nobari⁸,⁹,*

Author details

¹ Exercise Physiology, Faculty of Educational Sciences and Psychology, Department of Sports Sciences, Shiraz University, Shiraz, Iran, daryanoosh@shirazu.ac.ir, h.alishavandi73@gmail.com, Jnemat@shirazu.ac.ir, afjf2020@gmail.com, enayat.asadmanesh@gmail.com

² Department exercise physiology, Kharazmi University, Tehran, Iran, aref.basereh@gmail.com

³ Sports Science School of Rio Maior - Polytechnic Institute of Santarém, 2040-413 Rio Maior, Portugal, rafaeloliveira@esdrm.ipsantarem.pt, jbrito@esdrm.ipsantarem.pt

⁴ Life Quality Research Centre, 2040-413 Rio Maior, Portugal

⁵ Research Centre in Sports Sciences, Health Sciences and Human Development, 5001-801 Vila Real, Portugal

⁶ Prince Sultan University, Sport Sciences and Diagnostics Research Group, GSD-HPE Department. Riyadh 11586, Saudi Arabia, pabloccjb@gmail.com

⁷ Neuroscience Research Center, Institute of Neuropharmacology and Department of Physiology and Pharmacology, Afzalipour School of Medicine, Kerman University of Medical Sciences, Kerman, Iran, k.khoramipour@gmail.com

⁸ Faculty of Sport Sciences, University of Extremadura, 10003 Cáceres, Spain, tgarcia@unex.es

⁹ Department of Motor Performance, Faculty of Physical Education and Mountain Sports, Transilvania University of Brașov, 500068 Brașov, Romania

References


Tables

Table 1 The specific training protocols for 8 weeks for both groups

<table>
<thead>
<tr>
<th>Time of CSSG</th>
<th>Time intervals of ISSG</th>
<th>Sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 min</td>
<td>5 min, 1 min rest between intervals * 5</td>
<td>1-6</td>
</tr>
<tr>
<td>30 min</td>
<td>5 min, 1 min rest between intervals * 6</td>
<td>6-12</td>
</tr>
<tr>
<td>35 min</td>
<td>5 min, 1 min rest between intervals * 7</td>
<td>12-18</td>
</tr>
<tr>
<td>40 min</td>
<td>5 min, 1 min rest between intervals * 8</td>
<td>18-24</td>
</tr>
</tbody>
</table>

CSSG, continuous small-sided game, ISSG, interval small-sided game, min, minutes.

Figures
Figure 1

The pre-test and post-test A) Average power, B) Aerobic power, C) Yo-Yo Test, D) Illinois agility and E) 30-m test in both groups. The sign $ indicates a significant difference between the two groups and the sign * indicates a significant difference between pre to post training.
Figure 2

The pre-test and post-test A) Body fat percentage changes and B) Body weight measured in both groups.
Figure 3

Mean and standard deviation of changes in A) mean heart rate, B) the maximum heart rate and C) RPE in both groups. The sign $ indicates a significant difference between the two groups.