



HIGH INTENSITY INTERVALS TO IMPROVE THE SPECIFIC PERFORMANCE OF WEST JAVA WRESTLERS

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Abstract

Specific training methods is an important aspect in the preparation of wrestling athletes. The purpose of this study was to investigate the effect of a short-duration high-intensity interval training (HIIT) program with specific wrestling techniques on anaerobic performance. Twelve wrestling athletes were randomized into a control (n=6) or experimental groups (n=6). The experimental protocol consisted of 3 blocks of 6 sets of 10s all-out effort, with 10s passive recovery between sets and 1-min rest interval between blocks, conducted 3 days per week during 4-weeks. A three-way analysis of variance (ANOVA) (group, set and moment) with repeated measurements in the two last factors was conducted to compare the performance during each set of the Frequency Speed Kick Test (FSKT), and an ANOVA two-way (group and moment) with repeated measurements was used to compare the total number of kicks and kick decrement index (KDI). Both groups maintained their regular wrestling training, which was exactly the same. Before and after the training program the athletes performed the FSKT. The experimental group increased ($p < 0.01$) performance in each of the five sets of the FSKT and in the total number of kicks ($p < 0.001$). No statistical difference was observed in the control group after 4-weeks or between the control and experimental group in any moment. A short-duration HIIT program with specific wrestling techniques improved anaerobic performance measured through the FSKT. However, the fatigue index did not change.

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INTRODUCTION

The scoring action of wrestling is characterized by short-duration, high-intensity efforts, totaling 2x3 minute rounds and 30-second rest. However, studies investigating High Intensity Interval Training (HIIT) in martial sports such as wrestling use running as a mode of exercise (Franchini et al., 2019), and only two studies have used combat-specific measures during this type of exercise (Franchini et al., 2016). In addition, investigations on HIIT in combat sports used longer duration of stimuli (i.e. >30 seconds) (Franchini et al., 2017) compared to wrestling assessment measures in general or effort gap ratios observed in wrestling matches (Bridge et al., 2011).

High-intensity interval training (HIIT) involves repetitive high-intensity exercise over short periods (45 seconds) to long (2-4 minutes), interspersed with recovery periods (Buchheit & Laursen, 2013). Buchheit and Laursen (2013) categorize HIIT in four main types: (a) long-interval HIIT, with effort lasting more than 1 minute at an intensity equal to or slightly below maximal aerobic exertion, and work-rest ratios of 1:1, 1:2 or 1:3, with the primary goal of developing aerobic power and anaerobic systems; (b) HIIT short intervals, with efforts lasting less than 1 minute with an intensity equivalent to maximal aerobic exertion to 120% maximal aerobic exertion, and a work-rest ratio of 1:1, 2:1 or 3:1, with the primary objective of developing aerobic power and anaerobic systems; (c) repetitive sprint exercises, with very short movements (5-8 seconds) with an intensity of approximately 120-160% of maximal aerobic strength, with a very long recovery period (i.e. >6 times longer than the duration of the effort), and directed to neuromuscular and metabolic development normally required in team sports; and (d) sprint interval exercises, with an effort of typically 30 seconds, performed in all-out mode, separated by intervals of 3 to 4 minutes, resulting in very high oxidative and glycolytic requirements.

In recent years several investigations have shown positive effects of HIIT in combat sports, such as judo (Kim et al., 2011), karate (Ravier et al., 2009), and Olympic wrestling

(Farzad et al., 2011). Typically, these studies use training programs of varying intensity from submaximal effort (80% maximal aerobic speed) to all-out effort, with low volumes lasting 4 to 8 weeks, since this is a general period in which training can be intensified between sequential exercises. combat sports competitions (Franchini et al., 2019). But the protocol has been implemented through non-specific exercises. Specificity is an important training principle to ensure optimal adaptation and improve performance (Habibie et al., 2023). In this context, three components of specificity must be considered for training prescriptions (energy system, muscle groups, exercise capacity) (Reilly et al., 2009).

(Kamandulis et al., 2018) investigated the effects of combat sports specific movements during HIIT on physical performance. It has been proven that, in judo, the HIIT protocol for 4 weeks using sport-specific techniques (uchi-komi) produces positive effects on peak strength in the upper and lower body (Franchini et al., 2016), in addition to showing improvement in a specific judo test called the "Special Judo Fitness Test" (Franchini et al., 2016). In boxing, Kamandulis et al., (2018) demonstrated that 4-week HIIT using a special "all-out" protocol, i.e. maximum effort within a given period of time (3 rounds of 14 sets of 3-s all-out punching bags with a 10-second rest between sets and 1 minute between rounds) resulted in increased peak oxygen consumption and peak power in a progressive arm crank test.

During simulated boxing matches, they observed an increase in punch strength and maintenance of punch frequency for the experimental group compared to the control group. Despite these reports, specific training strategies that serve as tools to improve performance-related characteristics in combat sports are lacking. Wrestling scoring actions are characterized by short-duration, high-intensity efforts, with a total attack time of approximately 15 seconds per round and an attack time of 47 seconds in three rounds. However, studies investigating High Intensity Interval Training (HIIT) in combat sports used running as an exercise mode (Franchini, Cormack, & Takito, 2019), and only two studies used combat-specific measures during

this type of exercise (Franchini et al., 2016; Kamandulis et al., 2018).

In addition, investigations on HIIT in combat sports used longer duration of stimuli (i.e. >30 seconds) (Franchini et al., 2019) compared to wrestling assessment measures in general or effort pause ratios observed in wrestling matches (Bridge et al., 2011)

METHODS

Experimental approach to the problem

The wrestling athletes (n=12) were randomly allocated into control or experimental groups. The control group performed only wrestling specific training during 4-weeks. The experimental group performed the same regular wrestling training program as the control group and, additionally, a short-duration HIIT program using wrestling-specific technique (bandal tchagui), three times a week during four weeks. The 4-week training program was set to cope with the typical interval that high-level wrestling athletes have to conduct intensified training between competitions. As athletes normally take part in 8 to 10 competitions during the year, the high-intensity training (including HIIT and other training means) can be performed typically during four weeks. The athletes from control and experimental groups performed the FSKTmult before and after the training period. All athletes involved in this study had experience with FSKT testing procedures. The test was executed in the training center where each athlete trained, during the competitive period. Before the testing session, a general and specific warm-up routine was performed. It was composed by running, stretching, and low-intensity kicks and punches totalizing approximately 15 minutes. The Figure 1 shows the experimental design. Participants were instructed to maintain their normal lifestyle and regular dietary intake during the study. All athletes had their last meal at least 2 hours before the test and were hydrated ad libitum. Additionally, they had 48

hours of rest before each test (pre and posttest) without consuming caffeine. Training center where each athlete trained, during the competitive period. Before the testing session, a general and specific warm-up routine was performed. It was composed by running, stretching, and low-intensity kicks and punches totalizing approximately 15 minutes. All athletes had their last meal at least 2 hours before the test and were hydrated ad libitum. Additionally, they had 48 hours of rest before each test (pre and posttest) without consuming caffeine.

Participants

Twelve national wrestling athletes (two females and ten males) participated in this study. The control group was composed by six athletes (five males and one female) and the experimental group was composed by six athletes (five males and one female). Table 1 shows participants' demographic data. All were competitive wrestling athletes and met the following inclusion criteria: a) greater than 3 year of wrestling experience; b) training three or more times per week; c) having participated in national tournaments organized by the National Wrestling Sports Federation (PGSI), an organization recognized by the World Wrestling; d) enrolled in a club affiliated with PGSI; and e) provided an informed consent or provided an informed consent signed by their parent or guardian, in the case of minor participants, authorizing the use of the data for scientific purposes. None of them were reducing weight during the period this study was conducted, which was the in-season competition phase. The wrestling athletes were free from any injury and neuromuscular disorder. All athletes or parents of athletes younger than 18 years provided written consent after being informed about the procedures and risks associated. This research was approved by the Institutional Ethics Committee

Group	Age (years)	Body mass (kg)	Height (m)	Practice time (years)
Control (M±SD)	21.3±5.6	75.9±11.4	1.74±0.09	4.2±0.4
Experimental (M±SD)	20.2±5.4	72.3±13.4	1.71±0.12	4.5±0.6

FINDINGS AND DISCUSSION

The purpose of this study was to determine the effect of additional short-duration HIIT programs using wrestling-specific techniques that were carried out intermittently and measured through FSKT. Key results of This study is a 4-week HIIT program increasing the number of kicks in each of the five sets of FSKT and total FSKT separately. This section must be the most numerous, a minimum of 60% of the entire body of the article.

Discussion

Due to the time duration of FSKT-1 and FSKT-total, as well as the maximum effort characteristics, the performance of both versions of FSKT can be considered an indicator of anaerobic performance. In this study, like Santos and Franchini's (2016) study, we found significant differences after the training program. There were no differences between groups before starting the experimental intervention; this suggests that just an additional 8 minutes of HIIT using wrestling-specific techniques can improve performance as measured through FSKT.

But in KDI there is no change. In addition, the control group did not change the performance of the entire study, and no difference was observed between the experimental and control groups at any time.

Previously, a 9-week wrestling training study also did not report changes in KDI (Santos & Franchini, 2018). Therefore, it seems that this variable is not recommended to measure changes in athletes' performance or only interventions that encourage greater modifications that can be detected by this

variable. This can be attributed to the fact that the fatigue index during repeated sprint ability tests – which is characteristic of multi FSKTs presents higher variation and is less reliable than other variables in these tests such as average power/speed, total time or total amount repetition (Lopes-Silva et al., 2019).

Regarding strength and anaerobic capacity, the training protocol lasted between four and 8 weeks and reported an increase in peak and average strength in the Wingate test in the experimental group compared to the control group (Monks et al., 2017). However, only the research of Franchini et al. (2016) and Kamandulis et al., (2018) used combat sport-specific training and testing protocols, in investigations of judo and boxing athletes. Thus, the main contribution of this study was to provide evidence that wrestling-specific HIIT protocols were able to improve performance measured by FSKT in just 4 weeks (Sartono & Adityatama, 2020).

Ravier et al. (2009) reported an increase in maximal oxygen deficit accumulation in karate athletes who underwent HIIT for seven weeks plus regular karate training, while Monks et al. (2017) compared wrestling athletes who underwent HIIT or high-intensity continuous running (HICR) for 4 weeks, and found a higher improvement in the Wingate Test in the HIIT group compared to the HICR group. The findings of Monks et al. (2017) are relevant considering that performance during the Wingate test is superior in high-level competitive wrestling athletes compared to lower-level competitors (da Silva Santos & Franchini, 2016). Therefore, our study is supported by previous studies conducted on karate and wrestling athletes who follow HIIT running and who improve their strength and anaerobic capacity in non-specific tests.

Findings

There was a significant interaction effect between FSKT_{mult}, before and after the intervention, and the group ($F_{4,40}=3.61$,

$p=0.013$, observation strength: 0.83). The difference showed an increase in post-intervention moment performance in FSKT1 ($p=0.010$), FSKT2 ($p=0.003$), FSKT3 ($p<0.001$), FSKT4 ($p<0.001$) and FSKT5 ($p<0.001$) compared to before the intervention. The difference between the moments before and after the intervention was not observed in the control group ($p>0.05$). There was no difference between the groups comparing before and after the intervention ($p>0.05$).

In FSKTtotal there is an effect of interaction between moment and group ($F_{1,10}=21.43$, $p=0.001$, observation strength: 0.99). In FSKTtotal there is an effect of interaction between moment and group ($F_{1,10}=21.43$, $p=0.001$, observation strength: 0.99). The difference showed an increase in the number of kicks in the post-intervention moment compared to the pre-intervention moment only in the experimental group ($p<0.001$). There was no difference between the groups in the pre- and post-intervention stages ($p>0.05$). No significant effect or interaction ($p>0.361$) was found on KDI.

CONCLUSION

In practical terms, this study provides wrestling coaches with tools to improve anaerobic performance, using specific short-duration training programs, with temporal structures similar to those found during competition and of the same duration in a single fight match. Among the advantages of the study are the design that allows having a control group with similar characteristics to the experimental group, the simplicity of the test that can be replicated by specialized trainers and instructors without the need for expensive equipment. As a limitation, we recognize the small number of athletes (10 men and two women), age range and difference in experience, however, having a larger sample in competitive sports is difficult, especially when

national and international athletes are evaluated.

High-intensity and short-duration interval training programs with specific wrestling techniques resulted in improved anaerobic performance measured through FSKT. But the fatigue index did not improve. Thus, in just four additional weeks HIIT was able to improve wrestling-specific anaerobic performance and high-intensity intermittent, suggesting that strength wrestling and conditioning trainers can use similar structures to improve anaerobic.

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714

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02552

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