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The Effect of Core Training on Agility in Junior Boxing Athletes

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Abstract

The purpose of this study was to analyze the effect of core training on the agility of junior category boxing athletes. This type of research is experimental, core training as the experimental group (EG) and control group (CG). The sample was 12 junior boxers divided into 2 groups EG and CG, age characteristics 15.8±4.2 years and training level 2.8±3.7 years. The core training program is 1) Hollow Body Hold, 2) Crawls, 3) Dumbbell Sit Ups, 4) Push Up Walk Out, 5) Sit-up, 6) Spider Walk, 7) Reverse Crunch to Rainbow, 8) Back-up, 9) Med Ball Chops and Twists, 3 - 5 sets, 8 - 12 repetitions, recovery 3 - 6 minutes, intensity 60% - 80%. While the control group is boxers who train routinely. This study was conducted in 18 meetings with 3 meetings each week. Agility test instruments used, Shuttle Run Test, Hexagonal Test, Zig-Zag Run Test. The results, Wilcoxon test ($p<0.05$) on EG are Shuttle Run Test sig. 0.011; Hexagonal Test sig. 0.008; Zig-Zag Run Test sig. 0.010. While CG is Shuttle Run Test sig. 0.042; Hexagonal Test sig. 0.046; Zig-Zag Run Test sig. 0.042. Mann-Whitney test ($p<0.05$) is $0.032<0.05$, thus EG is recommended as a variation of training to improve agility. Core training has increased agility in junior boxers, then found improvements in stability, coordination, footwork and movement efficiency. In addition, studies found that core training can prevent injury and can be used as an adaptation to intense training. So it will be useful to optimize performance.

Keywords: *Core Training, Boxing Performance, Junior Athletes, Agility*

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INTRODUCTION

Agility is one of the components of physical skills needed by combat sports athletes. Agility in combat sports plays an important role in attacking, avoiding enemy attacks, outwitting enemies (Hikmah et al., 2023). Agility combines muscular strength, speed, balance because athletes must change paths at a steady pace without losing balance or falling (Almas et al., 2023). Agility can support fighters to overcome obstacles during the match. In addition, agility can also help improve the coordination of brain and body movements so that it can make the athlete's movements more effective and efficient (Nurhayati et al., 2023). In combat sports, one of the sports that requires agility is boxing.

In the sport of boxing, agility is very useful for moving to attack, countering an opponent's attack, and even avoiding an opponent's attack (X. Zhang & Cheng, 2023). In addition, boxing is a sport that involves punches, so footwork is very much needed in this sport. However, research results show that footwork is still not enough to train and improve agility (Ihsan et al., 2023). Strength training methods are still needed to support footwork or footwork so that boxers have good agility. The facts in the field, the agility of junior category boxers

aged 15-16 years is still relatively low. Then, the observation was continued to the opinions of boxers, that they thought they were only able to do good footwork at the beginning of the round. Then the statement from the coach, that according to him, boxers when moving quickly while changing direction, tend to be stiff or the body seems to fall. So that it affects the quality of the punching technique.

Recommendations based on research results, strength training methods that can be used to improve agility are core training (Dinç & Ergin, 2019). Compared to other training methods such as ladder drill, cone drill, bouncing ball (Setiyawan, 2018, Arifin et al., 2022, Hikmah et al., 2023), Core training has the advantage of increasing midsection stability, improving posture, which is crucial for moving quickly while changing direction in boxing. Based on the results of previous research, core training has an impact on speed, quickness and agility in 18 year old soccer players (Doğanay et al., 2020). The training was conducted for 30-35 minutes, three days a week for eight weeks. In volleyball, core training has the benefit of increasing agility, explosive strength and balance for eight weeks with three days of training per week (Çakir & Ergin, 2022) . Then, core training carried out by tennis players aged 10-14 years has an impact on agility, strength performance and tennis skills (Arslan & Ergin, 2022). Thus, based on the results of previous research, the core training method can improve other physical abilities besides agility, and also affect technical skills.

Therefore, based on the problems in the study and the results of previous studies, the purpose of this study is to analyze the effect of core training on the agility of junior category boxing athletes. Then the type of core training, so far there has been no scientific publication for boxing, especially in improving the agility of boxers. So the results of this study will be a good reference for coaches, boxing instructors, physical trainers, readers so that the strength training model is not monotonous, but easy to do and can improve performance..

METHOD

This type of research is a quasi-experiment with a two-group pretest-posttest design. This study involved two groups, namely the experimental group with core training (EG) and the control group (CG), namely athletes doing routine training as usual. In this study, boxers voluntarily chose between the experimental group or the control group. Before the treatment, boxers will be measured through a pretest in the form of an agility test, after the treatment is carried out, the boxers will be measured again through a pretest. Then the agility test as a pretest and posttest uses 3 types of tests, 1) shuttle run, 2) hexagonal test, 3) zig-zag run. The purpose

of using these three types of tests is to test more accurately the effectiveness of the core training program on boxer agility.

The population of this study was junior category boxers in Brebes Regency with an age range of 15-16 years according to the IBA (International Boxing Association) rules. In order for this study to produce accurate data, the junior category boxers have two criteria, namely 1) still being active athletes, 2) having participated in boxing competitions at least at the district level. So that the characteristics of the boxers are 12 boxers consisting of 8 male boxers and 4 female boxers, then grouped into 6 experimental group boxers and 6 control group boxers, with an average (mean±SD) age of 15.8±4.2 years, and a training level of 2.8±3.7 years. The samples involved in this study had a health certificate and were able to follow this study to completion.

The core training program was conducted for 6 weeks divided into 18 meetings. Training was conducted 3 days a week, namely Monday, Wednesday, Friday, in the afternoon. The following is a core training program for junior category boxing athletes (table 1). In this type of core training, there are 9 types of exercises that are trained repeatedly and gradually for 6 weeks. While for the control group, boxers did routine training under the supervision of a trainer.

Table 1. Core Training Program

Core Training Exercises	**Week**	**Sets**	**Repetition**	**Recovery**	**Intensity**
1. Hollow Body Hold 2. Crawls 3. Dumbbell Sit Ups	Week 1 - 2	3	8	3 minutes	60%
4. Push Up Walk Out 5. Sit-up 6. Spider Walk	Week 3 - 4	4	10	4 minutes	70%
7. Reverse Crunch to Rainbow 8. Back-up 9. Med Ball Chops and Twists	Week 5 - 6	5	12	6 minutes	80%

The data analysis of this study used SPSS 26. The first analysis to test the results of the pretest and posttest using the Wilcoxon test on the experimental group and the control group with a significance value ($p < 0.05$). The second analysis was with Mann-Whitney to analyze the average difference between the experimental group and the control group ($p < 0.05$).

RESULT

The first analysis of this study is to analyze the effect of giving treatment, using the Wilcoxon test (p <0.05). Below are the results of the pretest and posttest on the core training group in table 2.

Table 2. Test results in the experimental group

	Shuttle Run Test	Hexagonal Test	Zig-Zag Run Test
Z	-2,607[b]	-2,701[b]	-2,636[b]
Asymp. Sig. (2-tailed)	0,011	0,008	0,010

Based on table 2, core training treatment has a positive effect on the agility of junior category boxing athletes, agility tests using the Shuttle Run Test sig. 0.011<0.05, Hexagonal Test sig. 0.008<0.05, Zig-Zag Run Test sig. 0.010<0.05. Then the results of the pretest and posttest in the control group in table 2.

Table 2. Test results on the control group

	Shuttle Run Test	Hexagonal Test	Zig-Zag Run Test
Z	-2,034[b]	-1,932[b]	-2,032[b]
Asymp. Sig. (2-tailed)	0,042	0,046	0,042

Based on table 3, the training in the control group has a positive effect on the agility of junior category boxing athletes, the agility test using the Shuttle Run Test sig. 0.042<0.05, Hexagonal Test sig. 0.046<0.05, Zig-Zag Run Test sig. 0.042<0.05. Then the results of the agility test will be compared between the experimental group, namely the core training and the control group to see the average difference using the Mann-Whitney test (p<0.05). The following are the results of the Mann-Whitney test in table 4 below.

Table 4. Results of the difference test between the experimental group and the control group

	Agility
Mann-Whitney U	129,000
Wilcoxon W	300,000
Z	-2,150
Asymp. Sig. (2-tailed)	0,032

DISCUSSION

The first analysis in this discussion, based on the results showing that the treatment group (core training) and the control group had a positive effect on increasing agility in junior boxing athletes. This confirms the importance of general physical training in increasing athlete agility. In contrast to conventional training which focuses more on increasing stamina or specific strength, core training specifically improves the integration and coordination of the core muscles which support almost all movements in boxing, from attacks to defensive maneuvers (Jo et al., 2022). Core training, which engages the core muscles of the body, helps in the stabilization of the entire body during the fast and dynamic movements that are so common in boxing (Wu, 2022). This stability can affect the speed and precision of movement, which is essential in sports such as boxing (Y. Zhang et al., 2023).

The second analysis is the experimental results showed a significant difference in the average post-test results between the core training group and the control group. This indicates that although both groups showed improvement, the group that underwent core training had a more significant improvement compared to the control group that may have undergone regular or non-specific training. This difference can be attributed to the specific benefits obtained from core training which not only improves agility but also improves the athlete's ability to control their movements better (Ahn et al., 2018 & Fadhila et al., 2024) which is vital in competitive sports such as boxing.

The results of the study found that the result of athletes who never do core training is weak core muscles which have an impact on stability and balance. This is because instability causes poor movement efficiency, which not only reduces power and speed in the punch, but also increases the risk of injury, especially in the back and hips (Vera-García et al., 2015, Zemková & Zapletalová, 2021, Zemková & Zapletalová, 2022). Furthermore, a lack of core training can limit an athlete's ability to absorb and stabilize loads during intense exercise, slow

recovery between training sessions, and generally hinder physical adaptation to the specific demands of the sport (Rodríguez-Perea et al., 2023).

The third analysis is from the results obtained, that core training has great potential to be integrated into the training program of junior boxing athletes. Recommendations to include core training routinely in training can be based on evidence of significant agility improvements shown by the treatment group. In addition, routine implementation of core training can help in reducing the risk of injury, increasing stability and coordination, all of which can help athletes achieve more optimal performance (Lupowitz, 2023, Yue, 2023, Rodríguez-Perea et al., 2023). Therefore, this study confirms the importance of core training not only as a method to improve the physical performance of athletes but also as an important tool in holistic athletic development, which is in line with the specific needs and dynamics of the sport of boxing. This study also opens the way for further studies on specific aspects of core training and their effects on other aspects of boxing performance, such as endurance, strength, and reaction time (Gök & Özen, 2023).

The limitation of this study is that junior athletes have never done core training, as a result the coach must also fix the form of core training movements so that all muscles are stimulated. The hope for future research is to involve a large number of samples and more diverse variables with in-depth analysis methods. Then, with an agility test consisting of three tests, it can provide broader information.

CONCLUSIONS

Core training has significant significance in improving agility in junior boxers, then found improvements in stability, coordination, and movement efficiency. In addition, this study also identified gaps in core training exercises in junior athletes, indicating that more planned and systematic training and exposure to core training can help optimize the potential of agility and performance in boxers. This emphasizes the importance of core training as a basic component of athlete training programs, which not only support short-term goals in improving performance but also in the long-term development and sustainability of athlete careers. Recommendations for future research involve the use of broader variables and larger samples to gain a better understanding of the specific impact of core training on various aspects of boxing performance. This will provide more detailed insights that can be utilized by coaches to improve and refine training methods, as well as provide a strong database to support the training needs of junior boxers and athletes in general.

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