DOI 10.26773/smj.210603

SportMont

ORIGINAL SCIENTIFIC PAPER

Research on Exercises to Improve the Physical Strength of Male Athletes on High School Karate-do Teams

[1]Vinh Huy Chau

[1]Ho Chi Minh City University of Physical Education and Sport, Ho Chi Minh City, Vietnam

Abstract

The present study suggests suitable physical exercises for male athletes on high school karate-do teams to improve their physical strength. Coaches can use these exercises and related training methods for karate-do athletes in high schools in Vietnam. As a result of six months of training with these exercises, the professional achievements of athletes in all tests have made good progress. In particular, the test of alternately straight punching in kiba-dachi in 10 seconds results in the highest growth rate of w = 20.23%, while the outcome of the test of repeatedly jerking hands in 30 seconds is the lowest at w = 11.01%.

Keywords: *physical education, high school, karate-do, strength*

Introduction

Physical education (PE) is a critical subject in the school curriculum, contributing to students' comprehensive development (Bailey et al., 2009; Meyer et al., 2013; Wallhead, Garn, & Vidoni, 2013; Harvey, Kirk & O'Donovan, 2014; Evans, 2013). Physical exercises requiring significant efforts naturally foster good qualities, such as courage, willpower, determination, confidence, patience, self-discipline, team spirit, among others. They also enrich social and cultural life, help fight social problems and, in particular, build up trust and healthy lifestyles in the youth.

Karate-do is a martial art that originated in Japan. Due to its practicality and sportsmanship, karate-do quickly spread worldwide. In high schools in Vietnam, it is welcomed by many students as it is suitable for the training and physical conditions of Vietnamese people. However, the achievements of many male karate-do teams in high schools are inadequate. The main reason is poor physical strength. Meanwhile, exercises to enhance physical strength are non-systematic and inappropriate, mostly based on coaches' experiences. Therefore, it is vital to study exercises of strength enhancement for male karate-do athletes.

Macovei, E. A. Lambu, and I. S. Lambu (2013) researched the relationship between reaction time and achievements in karate-do. Their study results provide an important database for training athletes to improve their performance and achievements. Chaabene, Hachana, Franchini, Mkaouer, and Chamari (2012) assessed the physical and physiological condition of excellent male athletes and its impact on their performance. They concluded that while many factors affect the achievements, reaction time is the major one. Chan (2018) pointed out that karate-do can potentially become an effective strategy for the well-being of male youth. This research is also useful for educators, PE teachers and school administrators who deploy karate-do in high schools. To the best of our knowledge, while the have been several studies on karate-do (Bonotto et al., 2016; Jorga, Mastrappas, & Damigos, 2018; Takahata, Shiraki, Sakane, & Takebayashi, 2004; Masciotra, Ackermann, & Roth, 2001), no research on applying exercises to improve the physical strength of male karate-do athletes, especially at the high school level, has been carried out and published.

This paper suggests suitable physical exercises for male athletes on high school karate-do teams to improve their physical strength through selective tests to assess and examine the ath-

Correspondence:

V. H. Chau
Ho Chi Minh City University of Physical Education and Sport, Ho Chi Minh City, 700000, Vietnam
Email: huyvcc@upes.edu.vn

letes' conditions after six months of training. Finally, the growth rate of each test was determined to evaluate the effectiveness of the proposed method.

Methods

We interviewed experts, coaches, and teachers, and then distributed tests on improving specific aspects of physical strength based on their opinions. These tests include: 1) repeatedly jerking hands for 30 seconds; 2) alternately straight punching in kiba-dachi in 10 seconds; 3) repeatedly cross-punching to the target in 15 seconds; 4) roundhouse kicking with front and back legs to the target in 15 seconds; 5) cross-punching and roundhouse kicking to the target in 15 seconds.

Repeatedly jerking hands in 30 seconds

Required tools: rubber mat (otherwise, do the test on the floor), a timer. How to perform: The participant stands on the spot with fists clenched in front of the chest, then simultaneously punches forward and jerks hands back to the first position (the whole process counts as one time). Repeat in 30 seconds as in Figure 1. How to count: Count the number of times performed in 30 seconds.

FIGURE 1. Repeatedly jerking hands in 30 seconds

Alternately straight punching in kiba-dachi in 10 seconds

Required tools: rubber mat (otherwise, do the test on the floor), a timer. How to perform: The participant stands in kiba-dachi (horse stance), then alternately and repeatedly punches to the target. Perform twice, each time in 10 seconds, with a break of 30 seconds, as in Figure 2. How to count: Count the time with the better performance.

FIGURE 2. Alternately straight punching in kiba-dachi in 10 seconds

Repeatedly cross-punching to the target in 15 seconds

Required tools: rubber mat (otherwise, do the test on the floor), a timer. How to perform: The participant stands in front stance and performs cross-punching to the target. Perform 3 ses-

FIGURE 3. Repeatedly cross-punching to the target in 15 seconds

sions, each session in 15 seconds, with a break of 1 minute between two sessions, as in Figure 3. How to count: Count the time with the best performance.

Roundhouse kicking with front and back legs to the target in 15 seconds

Required tools: rubber mat (otherwise, do the test on the floor), a timer, kick pads. How to perform: The participant stands in defence posture, alternately performs roundhouse kicking with front and back legs to the target. Perform 2 sessions, each session in 15 seconds, with a break of 1 minute, as in Figure 4. How to count: Count the time with the better performance.

FIGURE 4. Roundhouse kicking with front and back legs to the target

Cross-punching and roundhouse kicking with front leg to the target in 15 seconds

Required tools: rubber mat (otherwise, do the test on the floor), a timer, kick pads. How to perform: The participant stands in front stance, performs cross-punching then roundhouse kicking with front leg to the target. Perform 2 sessions, each session in 15 seconds, with a break of 30 seconds, as in Figure 5. How to count: Count the time with the better performance.

FIGURE 5. Cross-punching and roundhouse kicking with front leg to the target in 15 seconds

Results

To carry out the experiment, we selected 15 male athletes from the karate-do team of Binh Hung Hoa High School, Binh Tan District, Ho Chi Minh City, Vietnam. The six-month training was divided into three stages (24 weeks), with three training sessions per week, each session took 90 minutes. The first stage is to adapt to the normal speed, with the period from week 1 to week 8. This stage to develop general speed. Focusing on exercising groups including muscles, tendons, and ligaments to improve joint flexibility. The second stage is to maximize the focus and speed, with as much strength and high speed as possible, and the period from week 9 to week 16. The third stage is to develop specific strength. This stage is mainly practiced to increase the speed of the leg, reduce the weight, and increase the intensity of the exercise. The results are presented as in Table 1 and Figure 6 below:

Table 1. Growth rates in physical strength of male athletes in high school karate-do team

Tests	M1	M2	d	w (%)	t	p
Repeatedly jerking hands in 30 seconds (times)	52.33	58.53	6.20	11.01	8.14	<0.05
Alternately straight punching in kiba-dachi in 10 seconds (times)	24.27	29.73	5.47	20.23	11.87	<0.05
Repeatedly cross-punching to the target in 15 seconds (times)	26.53	31.47	4.93	16.93	12.89	<0.05
Roundhouse kicking with front and back legs to the target in 15 seconds (times)	17.00	20.73	3.73	19.68	10.07	<0.05
Cross-punching and roundhouse kicking to the target in 15 seconds (times)	11.60	13.27	1.67	13.51	13.69	<0.05

Legend: M1 - the average achievement before training; M2 - the average achievement after 6 months of training, d - the difference of the average; w - the growth rate; t - the test value of 2 related samples; p - the correlation coefficient.

The test of repeatedly jerking hands in 30 seconds: the average achievement after six months of training is 58.53 times, 6.20 times more than that before training, which is 52.33 times, corresponding to the growth rate w=11.01%. This difference is statistically significant as $t_{calculated}=8.14>t_{standard}=2.145$ at the possibility $p<0.05$. As a result, the athletes have made obvious progress in repeatedly jerking hands in 30 seconds after the training.

The test of alternately straight punching in kiba-dachi in 10 seconds: the average achievement after six months of training is 29.73 times, 5.47 times more than that before training, which is 24.27 times, corresponding to the growth rate w=20.23%. This difference is statistically significant as $t_{calculated}=11.87>t_{standard}=2.145$ at the possibility $p<0.05$. As a result, the athletes have made obvious progress in alternately straight punching in kiba-dachi in 10 seconds after training.

The test of repeatedly cross-punching to the target in 15 seconds: the average achievement after six months of training is 31.47 times, 4.93 times more than that before training, which is 26.53 times, corresponding to the growth rate w=16.93%. This difference is statistically significant as $t_{calculated}=12.89>t_{standard}=2.145$ at the possibility $p<0.05$. As a result, the athletes have made obvious progress in repeatedly cross-punching to the target in 15 seconds after training.

The test of roundhouse kicking with front and back legs to the target in 15 seconds: the average achievement after six months of training is 20.73 times, 3.73 times more than that before training, which is 17.00 times, corresponding to the growth rate w=19.68%. This difference is statistically significant as $t_{calculated}=10.07>t_{standard}=2.145$ at the possibility $p<0.05$. As a result, the athletes have made obvious progress in roundhouse kicking with front and back legs to the target in 15 seconds after training.

The test of cross-punching and roundhouse kicking to the target in 15 seconds: the average achievement after six months of training is 13.27 times, 1.67 times more than that before training, which is 11.60 times, corresponding to the growth rate w=13.51%. This difference is statistically significant as $t_{calculated}=13.69>t_{standard}=2.145$ at the possibility $p<0.05$. As a result, the athletes have made obvious progress in cross-punching and roundhouse kicking to the target in 15 seconds after training.

Discussion

Through the above analysis, we observed the growth in specific physical achievements of athletes from the karate-do team of Binh Hung Hoa High School, Binh Tan District, Ho Chi Minh City, Vietnam after six months of training. In particular, the test of alternately straight punching in kiba-dachi in 10 seconds results in the highest growth rate with w=20.23%, while the outcome of the test of repeatedly jerking hands in 30 seconds is the lowest with w=11.01%.

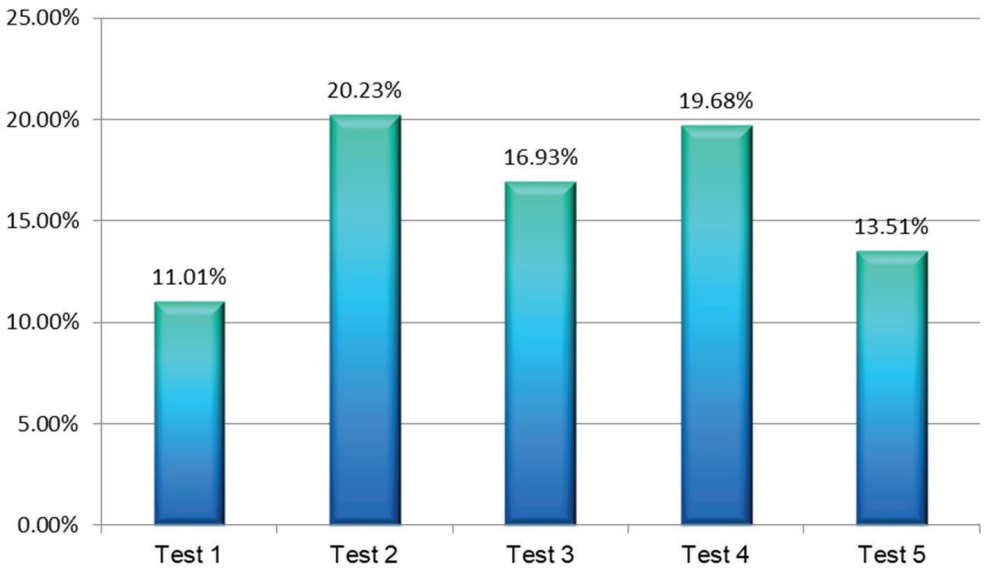

FIGURE 6. The growth rate of the physical strength of male athletes on high school karate-do team.

Le (2012) proposed a system of fitness assessment for female athletes aged 16 to 18 years including side splits, front splits, running, backhand punches, far bounces, push-ups, rope skips, and sit-ups. Nguyen (2002) introduced a system of fitness assessment tests including 6 tests: running 30m, jumping away, running 1500m, bending bridge, side splits, front splits. These studies show that to evaluating the athlete's fitness mainly based on the previous guidelines. Although the authors have given the rating scales for karate-do athletes, but have not shown the reliability of the tests, especially those of the professional test group. Our research has outlined several exercises to improve the fitness of male Karate-do athletes, while also showed the reliability of the tests. Based on the study as a reference, coaches can set out exercises and training methods suitable for karate-do athletes in high schools in Vietnam. However, in the practical application, we need to broaden the research into deeper and more comprehensive on the physical development, strength, psychology, and morphology of male karate-do athletes.

From the study results, we have selected a system of reliable tests to assess the physical strength of male athletes from the high school karate-do teams. The research also assesses the effectiveness of applied exercises in practice. These results are a basic reference for coaches and PE teachers to develop training curriculum of karate-do at the high school level.

Acknowledgements
There are no acknowledgements.

Conflict of Interest
The authors declare that there is no conflict of interest.

Received: 20 April 2020 | **Accepted:** 09 June 2020 | **Published:** 01 June 2021

References

Bailey, R., Armour, K., Kirk, D., Jess, M., Pickup, I., Sandford, R., & Education, B. P. (2009). The educational benefits claimed for physical education and school sport: an academic review. *Research papers in education*, *24*(1), 1-27.

Bonotto, D., Namba, E. L., Veiga, D. M., Wandembruck, F., Mussi, F., Afonso Cunali, P., ... & Azevedo-Alanis, L. R. (2016). Professional karate-do and mixed martial arts fighters present with a high prevalence of temporomandibular disorders. *Dental traumatology*, *32*(4), 281-285.

Chaabene, H., Hachana, Y., Franchini, E., Mkaouer, B., & Chamari, K. (2012). Physical and physiological profile of elite karate athletes. *Sports medicine*, *42*(10), 829-843.

Chan, J. W. (2018). School-based karate-do: Supporting the well-being of gay male youth. *Canadian Journal for New Scholars in Education*, *9*(1), 96-105.

Evans, J. (2013). Physical Education as porn! *Physical Education and Sport Pedagogy*, *18*(1), 75-89.

Harvey, S., Kirk, D., & O'Donovan, T. M. (2014). Sport education as a pedagogical application for ethical development in physical education and youth sport. *Sport, Education and Society*, *19*(1), 41-62.

Jorga, I., Mastrappas, S., & Damigos, D. (2018). Identifying contributing factors to progress in karate-do using the fuzzy cognitive mapping approach. *Ido Movement for Culture. Journal of Martial Arts Anthropology*, *18*(1), 15-22.

Le H. P. T. (2012). *Research on the standards for evaluating the fitness level of female Karate-do athletes*. Physical Education and Sports University, Vietnam.

Macovei, S., Lambu, E. A., & Lambu, I. S. (2013). Study about the reaction time relation to sports performance in Karate Do. *Ovidius University Annals, Series Physical Education and Sport/Science, Movement and Health*, *13*(2), S228-S228.

Masciotra, D., Ackermann, E., & Roth, W. M. (2001). "Maai": The art of distancing in karate-do mutual attunement in close encounters. *Journal of Adult Development*, *8*(2), 119-132.

Meyer, U., Roth, R., Zahner, L., Gerber, M., Puder, J. J., Hebestreit, H., & Kriemler, S. (2013). Contribution of physical education to overall physical activity. *Scandinavian journal of medicine & science in sports*, *23*(5), 600-606.

Nguyen T. T. (2002). *Criteria for evaluating training in sports selection and coaching*. Sports publishing.

Takahata, M., Shiraki, K., Sakane, Y., & Takebayashi, Y. (2004, June). Sound feedback for powerful karate training. In *Proceedings of the 2004 conference on New interfaces for musical expression* (pp. 13-18).

Wallhead, T. L., Garn, A. C., & Vidoni, C. (2013). Sport Education and social goals in physical education: relationships with enjoyment, relatedness, and leisure-time physical activity. *Physical Education and Sport Pedagogy*, *18*(4), 427-441.