

The Effects of HIIT on Physical Abilities Among Special Education Students

Nurul Nadhira Mahfudz, Siti Hartini Azmi, Mirza Azny Mustafa, Siti Jameelah Md Japilus, Zulakbal Abd Karim, Mohd Fadhil Abdullah, Ali Md Nadzalan

Abstract: This study was conducted to identify the effect of high intensity interval training (HIIT) on physical ability among special education students. A total of 30 participants from a special education school were divided into two groups, treatment group (n=15) and control group (n=15). The treatment group underwent usual normal sports training with additional of HIIT for eight weeks while control group underwent usual normal sports training for the same period of time. The tests that were conducted are 1 minute half sit up, 30m sprint, agility t-test and standing long jump. Independent t-test results showed that treatment group produces significantly greater percentages improvement in performance compared to the control group in all the tests performed. As the conclusion, the inclusion of HIIT in training program increases the physical ability among special education students.

Index Terms: Disabled, high intensity interval training, physical abilities, special population

I. INTRODUCTION

All physical conditioning training programs designed have one thing in common which is to produce great results. Through a lot of researches been conducted over the years, many training methods has evolved that cause coaches and athletes to have various choices of training methods to select [1-3]. One of the training methods that keep increasing in its popularity is high intensity interval training (HIIT).

HIIT can be described as a 'run' training performed at different speeds for a certain period of time with minimal or no immediate breaks. The advantage of using HIIT training is that it takes a short time compared to other training methods that require longer durations.

HIIT has been proven as ideal for any young athlete in improving speed, power, endurance and overall athleticism

[4-7]. According to Schoenfeld and Dawes [8], HIIT is time efficient and can be effective to fulfil the physical fitness requirement of most athletes.

Through early exposure of sports in school, many achievements and successes that have been achieved by people with disabilities, especially in the Paralympic Games. Physical education is one of the subjects that disabled students took [9]. Physical education has been described as the learning environment that gives the disabled students opportunity to get mixed with their friends, that later help them to improve psycho-social wellbeing, physical fitness and motor skill acquisition [10]. This study showed that students with disabilities can gain a good physical fitness through exposure in physical training.

Physical education is among the subjects included in the syllabus of special education in Malaysia. This knowledge is crucial as it is believed that increasing physical fitness could be a key element in the rehabilitation process of individuals with learning disabilities. Unfortunately, many parents are not get used to the need of physical education that cause them to be excluded from physical education class [11].

Lack of research has been conducted on determining the effects of physical training on special population. This include HIIT which has been shown to be effective on other populations. This study aimed to identify the effects of HIIT training on physical ability among special education students.

II. METHODOLOGY

A. Participants

This is a quantitative experimental study that was conducted on 30 students of special education. Participants were divided into two groups. The training session were conducted three times a week for eight weeks. Data is taken during pre-test and post-test to see the effect of training in improving physical ability of special education students.

In this study, the exercises selected to be included in the HIIT were burpee, jumping jacks, knee highs, mountain climbers and push up. The treatment group performed HIIT 3 times a week for 8 weeks. Each exercise was performed to the participants' best effort and was done for 20 seconds and was followed for 10 seconds rest period. This repetitions continues until the completion of four minutes. Pre-test was conducted prior the training intervention. Participants were given a briefing about the test. Picture cards were used in each test to make sure that the participants got a clear picture about the test.

Revised Manuscript Received on 30 May 2019.

* Correspondence Author

Nurul Nadhira Mahfudz*, Faculty of Sports Science and Coaching, Sultan Idris Education University, Malaysia.

Siti Hartini Azmi, Faculty of Sports Science and Coaching, Sultan Idris Education University, Malaysia.

Mirza Azny Mustafa, Faculty of Sports Science and Coaching, Sultan Idris Education University, Malaysia.

Siti Jameelah Md Japilus, Faculty of Sports Science and Recreation, Universiti Teknologi MARA, Kampus Arau, Malaysia.

Zulakbal Abd Karim, Faculty of Sports Science and Coaching, Sultan Idris Education University, Malaysia.

Mohd Fadhil Abdullah, Faculty of Sports Science and Coaching, Sultan Idris Education University, Malaysia.

Ali Md Nadzalan*, Faculty of Sports Science and Coaching, Sultan Idris Education University, Malaysia.

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an [open access](https://creativecommons.org/licenses/by-nc-nd/4.0/) article under the CC-BY-NC-ND license <http://creativecommons.org/licenses/by-nc-nd/4.0/>

The Effects of HIIT on Physical Abilities Among Special Education Students

The details of the participants were recorded in the score sheets. After the pre-test, researcher divided the participants into two groups; treatment group and control group. Participants then underwent training programs according to their respective programs 3 times a week for 8 weeks. After completing the 8 week training program, the participants were then being tested again to see the effect of the training on the physical abilities.

One minute half sit up test was conducted to assess muscular endurance. This test was conducted with feet was placed flat on the floor. Participants crossed their arm at the shoulders while the knees were bent at 90°. Participants curled their trunk up until their elbow touched the front part of their thighs and then return to the starting position. The total numbers of repetitions completed in 60 seconds were taken as the score. Only one trial was given to participants due to the difficulty of effort given in this test.

The 30 meter dash test was conducted to measure speed. The test involve stopwatch, measuring tape and adhesive tape. Participants started by standing behind the starting line. The release used the 'to line, ready and start' instruction. After the whistle was blown, participants run as far as 30 m as quickly as possible and time was recorded. Three attempts were given with a 5 minute break. The fastest time was taken into account.

Agility was tested using t-test (Figure 1) [12, 13]. Participants started with ready position and stand behind the line at the cone A. The participants need to sprint to cone B and touched the base of the cone with their right hand. They then need to shuffle sideways to cone C, and touch its base with their left hand. Participants then need to shuffle sideways to cone D and touched the base with the right hand. They then need to shuffle back to cone B, touch with the left hand, and run backwards to cone A. Stopwatch was stopped as the participant crossed the line at cone A. participants were given three trials with the best trial score was taken as the final score.

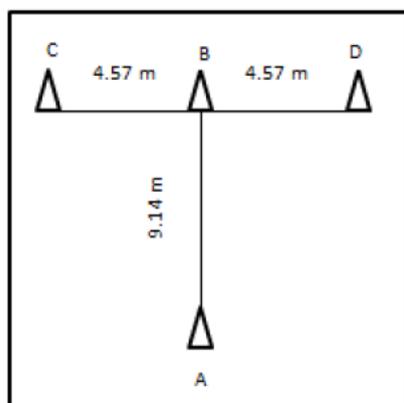


Figure 1: T-Test set up

Diagram source: Nadzalan, Mohamad [14]

Standing long jump was conducted to measure the power on the leg. It involved measuring tapes, rulers and scorecards. The test started with the participant stands behind the line with the foot resting open. Participants were instructed to get

ready to jump forward by swinging hands back and knees bent 90 degrees. Participants need to jump by using both feet as far as possible. The score was not counted if participants cannot balance the body and fall backwards and touch the area behind the foot. Participants were given three attempts. Measurements were made from the starting line to where the nearest heel is landing. The best distance from three attempts was taken into account as the absolute score.

C. Statistical Analysis

Paired sample t-test was run to compare the pre and post data score within groups. Independent t-test was conducted to compare the training effects between both groups.

III. RESULTS

Table 1 showed the physical characteristics of participants involved in this study.

Table 1. Physical characteristics of participants

Variables	Mean \pm SD
Age	16.26 \pm 1.45
Height	157.23 \pm 5.36
Body mass	49.54 \pm 4.84

Table 2 showed the mean score and standard deviation of test scores among the participants

Table 2. Test scores

Variables	Test	Treatment group Mean \pm SD	Control group Mean \pm SD	Sig.
1 minute half sit up (n)	Pre	20.80 \pm 8.29	18.74 \pm 9.24	
	Post	29.33 \pm 5.49	25.13 \pm 6.01	
	Sig.	0.000	0.000	
	%	40.98 \pm 1.52	34.15 \pm 2.34	0.000
Agility t-test (s)	Pre	14.01 \pm 0.57	14.18 \pm 0.31	
	Post	12.13 \pm 1.81	12.72 \pm 1.40	
	Sig.	0.000	0.000	
	%	13.50 \pm 1.27	9.98 \pm 0.52	0.010
Standing long jump (m)	Pre	2.15 \pm 0.32	2.11 \pm 0.40	
	Post	2.41 \pm 0.25	2.30 \pm 0.38	
	Sig.	0.000	0.000	
	%	12.21 \pm 1.01	9.00 \pm 0.27	0.024
30m dash (s)	Pre	4.93 \pm 0.28	4.98 \pm 0.32	
	Post	4.58 \pm 0.36	4.69 \pm 0.17	
	Sig.	0.002	0.010	
	%	7.19 \pm 0.27	5.87 \pm 0.38	0.032

Paired sample t-tests were conducted to compare all the physical tests within groups between pre and post intervention. For all variables, both treatment and control group showed significant improvement in the post-test when compared to the pre-test, $p < 0.05$.

Next, for the comparison between groups, independent t-test was conducted. The comparison was first made by calculating the percentage difference between pre and post test data in all variables. Then, the percentage differences for each variable were compared between groups. The percentage difference of the treatment group was shown to be greater in all the variables, $p < 0.05$.

IV. DISCUSSIONS

The aim of this study is to determine the effects of HIIT on the physical abilities. The treatment group underwent usual normal sports training with additional of HIIT for eight weeks while control group underwent usual normal sports training for the same period of time. 1 minute half sit up, 30m sprint, agility t-test and standing long jump were conducted as the measurement of physical abilities.

The paired t-test analysis revealed both training groups significantly improved their physical abilities in the post-test. Ignoring the quantity of improvement, just performing the normal sports training was found to be effective in improving the participants' physical abilities. This was just logic, as sports training also involved physical effort, thus chronically will improve physical abilities.

When we look at the quantity of improvement, it is obvious that the inclusion of HIIT was significantly more effective in improving the physical abilities compared to the normal sports training only. This supports the effectiveness of HIIT in improving speed, power, endurance and overall athleticism [4-7].

Despite many researches have been conducted on HIIT, majority of studies were conducted among athletes and normal populations [4, 15-17]. Least of studies have focused on examining the effects of HIIT on the special populations [17] especially among the school-aged participants. As the authors' knowledge, this current study was among the first to show the effectiveness of HIIT on special education students.

V. CONCLUSIONS

The results showed the effectiveness of HIIT in improving physical abilities among the special population. Thus, it is recommended for the teachers, to include HIIT as one of the training methods and also one of the health and fitness activities among their students in order to improve their fitness and functionality.

REFERENCES

1. Bompa, T.O. and C. Buzzichelli, *Periodization: theory and methodology of training* 2018: Human Kinetics.
2. Fleck, S.J. and W. Kraemer, *Designing Resistance Training Programs*, 4E 2014: Human Kinetics.
3. Haff, G.G. and N.T. Triplett, *Essentials of Strength Training and Conditioning 4th Edition* 2015: Human Kinetics.
4. García-Pinillos, F., et al., A High Intensity Interval Training (HIIT)-based running plan improves athletic performance by improving muscle power. *The Journal of Strength & Conditioning Research*, 2017. **31**(1): p. 146-153.

5. Ní Chéilleachair, N.J., A.J. Harrison, and G.D. Warrington, HIIT enhances endurance performance and aerobic characteristics more than high-volume training in trained rowers. *Journal of Sports Sciences*, 2017. **35**(11): p. 1052-1058.
6. Astorino, T.A., et al., Effect of high-intensity interval training on cardiovascular function, VO₂max, and muscular force. *The Journal of Strength & Conditioning Research*, 2012. **26**(1): p. 138-145.
7. Rahim, N.A., M.H. Hamzah, and N.A.A.M. Shalan, Kesan "sprint interval training"(SIT) ke atas indeks jisim tubuh dan peratusan lemak badan dalam kalangan individu berlebihan berat badan. *Jurnal Sains Sukan dan Pendidikan Jasmani*, 2018. **7**(2): p. 22-31.
8. Schoenfeld, B. and J. Dawes, High-intensity interval training: Applications for general fitness training. *Strength & Conditioning Journal*, 2009. **31**(6): p. 44-46.
9. Block, M.E., *A Teacher's Guide to Adapted Physical Education* 2016: Paul H. Brookes Publishing.
10. Zittel, L., J. Pyfer, and D. Auxter, *Principles and Methods of Adapted Physical Education & Recreation* 2016: Jones & Bartlett Publishers.
11. Fitzgerald, H. and A. Stride, Stories about physical education from young people with disabilities. *International Journal of Disability, Development and Education*, 2012. **59**(3): p. 283-293.
12. Stewart, P.F., A.N. Turner, and S.C. Miller, Reliability, factorial validity, and interrelationships of five commonly used change of direction speed tests. *Scandinavian Journal of Medicine & Science in Sports*, 2014. **24**(3): p. 500-506.
13. Nadzalan, A.M., J.F.L. Low, and N. Mohd Rasyid, Physical fitness profiles among a women hockey team preparing for Sukan Malaysia 2018. *International Journal of Engineering and Technology (UAE)*, 2018. **7**(4.42): p. 64-67.
14. Nadzalan, A.M., et al., Relationship between muscle architecture and badminton-specific physical abilities. *Human Movement*, 2018. **19**(1): p. 44-50.
15. Monks, L., et al., High-intensity interval training and athletic performance in Taekwondo athletes. *The Journal of Sports Medicine and Physical Fitness*, 2017. **57**(10): p. 1252-1260.
16. Ribeiro, R.L., et al., High-intensity interval training applied in Brazilian Jiu-jitsu is more effective to improve athletic performance and body composition. *Journal of Combat Sports and Martial Arts*, 2015. **6**: p. 1-5.
17. Elizondo, T., *Effects of upper body HIIT training on recreationally trained wheelchair athletes*, 2015, Eastern Washington University: USA.