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RESEARCH ON THE CURRENT PHYSICAL FITNESS STATUS OF TAIWAN U16 TRACK AND FIELD STUDENT ATHLETES

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Summary

The purpose of this study was to investigate the physical fitness status of Taiwan youth track and field athletes through fitness testing and to examine whether there are differences in jump height and sprint speed across different event groups. Methods: A total of 114 male youth track and field athletes were divided into four groups based on their specialties: sprints, middle- and long-distance runner, throwing, and jumping. The athletes passed squat jump and 60-meter sprint tests. Results: The average jump height for athletes was 35.48±6.11cm, and the average time for the 60-meter sprint was 8.46±0.47 seconds. There were no significant differences observed in jump height, 60-meter sprint times, or segmented sprint results across different event groups. Conclusion: The youth track and field athletes in this study developed comprehensively without overemphasizing their specialization. This comprehensive fitness training helped them excel in their events and perform well in competitive settings, enhancing both their athletic performance and long-term potential.

Keywords: student, physical performance, athlete development.

INTRODUCTION

In recent years, Taiwan's track and field athletes have demonstrated exceptional performances, achieving remarkable results in international competitions. For example, at the 2017 Summer Universiade, Taiwan won gold medals in both the men's 100-meter dash and men's javelin throw. At the U20 Asian Junior Athletics Championships, Taiwan secured 3 gold, 4 silver, and 6 bronze medals, while at the U18 Asian Youth Athletics Championships, the athletes claimed 3 gold, 3 silver, and 1 bronze medal. These outstanding performances spanned across different age categories, showcasing the country's excellence in track and field. Given the complexity of athlete development and the many factors that influence it, youth athletic performance requires long-term cultivation (Baker et al., 2018). A study by Shibli & Barrett (2011) investigated the top 20 ranked U15 track and field athletes in the United Kingdom and found that only 12% remained in the top 20 by the time they reached the U20 category. Research on elite professional athletes in Italy revealed that only 5% had been identified as high potential athletes at the ages of 12-13. These findings suggest that youth athletes may experience significant performance changes before the age of 16, and that professional success is not necessarily dependent on achievements during adolescence. Moreover, athletes who begin competitive sports later may have a greater chance of achieving outstanding results in the future (Boccia et al., 2017; Boccia et al., 2019). Therefore, understanding the developmental stages and changes in early performance can help improve the quality of scientific training and support long-term athlete development programs.

Track and field encompasses 48 events, including 24 men's events, 23 women's events, and 1 mixed event. Each event requires specific skills due to its unique characteristics. For example, sprinters need rapid, powerful muscle contractions to generate speed and explosiveness, while jumpers require excellent explosive strength and jumping ability to combine speed and power in order to execute high-quality jumps. Although the specific requirements vary across different events, research has shown that performance in the 20-meter sprint and the triple jump can help predict javelin throwing distances. Therefore, jumping and sprinting remain key indicators for track and field athletes (Zaras et al.,2019).Fitness testing plays a crucial role in evaluating athletic performance, as it not only assesses an athlete's physical capabilities (Hoffman, 2014) but also provides critical data for both coaches and

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athletes. Regular fitness testing helps coaches and athletes develop more targeted training plans to improve performance (Bourdon, 2017). Through fitness assessments, athletes can clearly understand their physical condition, including baseline fitness levels, progress tracking, targeted talent selection, and event-specific assignment, all of which are key factors in enhancing competitive performance. By identifying personal weaknesses, athletes can tailor their training to focus on areas needing improvement.Thus, the purpose of this study is to assess the current physical fitness status of Taiwanese youth track and field athletes through fitness testing and to examine whether there are significant differences in jump height and sprint speed among athletes in different events.

RESEARCH METHODS

Subjects

The participants of this study were male track and field athletes from 9 junior high schools in a

Changhua county in Taiwan. All participants were between the ages of 12 and 16 years old (classified as U16), with a total of 114 athletes undergoing testing. The athletes were further divided into four groups based on their track and field event specialties: sprints (n=55), middle- and long-distance the students and their parents signed informed consent forms to ensure ethical participation in the study.

Methods

This study employed various tests, including body composition analysis, 60-meter sprints, and squat jumps, to evaluate the athletes' speed, strength, and explosive power. The details of each test are as follows:

1. Body Composition: The InBody270 body composition analyzer was used, which measures various parameters such as body weight, fat mass, body fat percentage, skeletal muscle mass, and skeletal muscle percentage by passing a small electrical current through the body at different frequencies.

2. Speed: A wireless radio-based timing system was used to record sprint times at 0–5–10–30–60 meters to assess the athletes' speed changes during the start, acceleration, and high-speed phases. For the test, athletes performed a standing start, with the time recorded in seconds to two decimal places. Each athlete completed the test twice, and the best result was used.

3. Squat Jump: The Pasco PS-2414 force platform was used to measure the athletes' concentric lower limb strength, which indicates their ability to generate force at specific angles. The test required athletes to squat to a 90-degree knee angle, hold a ready position, and jump as quickly as possible after hearing the command "3, 2, 1, GO!" from the tester.

Analysis

All data were organized using Microsoft Excel, and descriptive statistics and analysis of variance (ANOVA) were conducted using SPSS 26 to determine whether there were significant differences between the groups. The significance level was set at $p < .05$.

RESULTS AND DISCUSSION

The study participants consisted of 114 adolescent male track and field athletes from a county in Taiwan, including 55 sprinters, 29 middle- and long-distance runners, 15 throwers, and 15 jumpers. The average jump height for U16 athletes was 35.48 ± 6.11 cm, and the average 60-meter sprint time was 8.46 ± 0.47 seconds. No significant differences were found between the four groups in terms of jump height, 60-meter sprint times, or split times for 0-5, 10-30, and 30-60 meters. Thus, it is inferred that athletes at the U16 age group follow the training regimen of the Long-Term Athlete Development Program promoted by World Athletics, focusing on the development of comprehensive physical abilities rather than specialization in specific skills. Zhao and Zhao (2023) emphasized that athletes aged 14-18 should continue to develop well-rounded physical abilities, particularly agility, speed, strength, and explosiveness, which will benefit specific strength development and future performance in specialized events. The basic information of the participants and the results of the fitness tests are shown in Table 1.

Chahal et al. (2015) indicated that there are no significant differences in 50-meter sprint times among sprinters, jumping athletes, and throwing athletes. These results are consistent

Table 1. Basic information table of subjects and results table of different special physical fitness tests

		Mean	Standard Deviation	F	p
age		13.6	0.84		
weight		52.1	10.55		
Squat Jump (cm)	Sprints	35.42	5.76	0.32	0.81
	Middle- and Long-Distance Athletes	34.74	6.43		
	Throwing Athletes	36.46	7.2		
	Jumping Athletes	36.17	6.2		
Speed (s)	Sprints	8.46	0.75	0.09	0.96
	Middle- and Long-Distance Athletes	8.51	0.62		
	Throwing Athletes	8.39	0.91		
	Jumping Athletes	8.44	0.48		
0-5 Meter Split Speed (s)	Sprints	1.1	0.27	0.49	0.69
	Middle- and Long-Distance Athletes	1.03	0.23		
	Throwing Athletes	1.06	0.37		
	Jumping Athletes	1.13	0.36		
10-30 Meter Split Speed (s)	Sprints	2.67	0.24	0.09	0.97
	Middle- and Long-Distance Athletes	2.66	0.21		
	Throwing Athletes	2.66	0.25		
	Jumping Athletes	2.63	0.15		
30-60 Meter Split Speed (s)	Sprints	3.9	0.43	0.32	0.81
	Middle- and Long-Distance Athletes	3.98	0.4		
	Throwing Athletes	3.86	0.41		
	Jumping Athletes	3.88	0.57		

with the findings of this study. This lack of difference may be related to the explosive nature required by these events. The 60-meter sprint test showed that sprinters and throwing athletes performed better than middle- and long-distance runners (Dietze.,2023) which aligns with the results of this study. Although no significant differences were found in sprint performance among the four event groups, the average results indicated that sprinters, throwing athletes, and jumping athletes outperformed middle- and long-distance runners. Chen (2021) conducted fitness tests on 15-year-old male track and field athletes and found no significant differences in physical fitness data across sprints, middle- and long-distance running, jumping, and throwing events, which is similar to the results of this study. Even across different types of events, the physical fitness distribution among adolescent athletes remains relatively consistent at this age.

CONCLUSION

Based on the results of this study, the training of U16 youth track and field athletes in Taiwan emphasizes comprehensive and well-rounded

development without overly focusing on specific abilities based on their event specialties. Instead, the training process prioritizes the development of diverse physical qualities such as speed, explosiveness, strength, and agility. This holistic training strategy enables athletes to enhance their overall athletic capabilities without being constrained by specialization, allowing them to showcase greater potential in future competitions. Furthermore, this concept of comprehensive development helps athletes stand out in highly competitive events, enabling them to demonstrate their competitiveness when facing challenges. For young athletes, this approach lays a solid foundation for their long-term athletic development, mitigating the risks and limitations associated with early specialization.

In addition, the study found that although there were no statistically significant differences in jump height and sprint speed tests across different events, this underscores the importance of holistic development during the athlete growth phase. Athletes focusing on improving their all-around capabilities—regardless of whether they are participating in sprints, middle- and long-distance running, throwing, or jumping events—can collectively develop the necessary foundational qualities throughout their training. This training approach not only effectively enhances athletes' competitive levels but also helps reduce the risk of sports injuries caused by excessive specialization, thereby supporting steady improvement in their long-term competitive careers. More importantly, this training philosophy aligns with current trends in international sports development, where diverse development of athletes contributes to cultivating more enduring and comprehensive competitive abilities, leading to sustained success at all levels of competition.

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