

Anthropometric and Physiological Performance of Hong Kong Young Athletes Versus Their Singapore and Sichuan Counterparts

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Introduction

Talent identification has emerged as a cornerstone in the strategic development of athletes, allowing coaches, sports scientists, and organisations to systematically recognise and nurture individuals with high sporting potential. 'Talent' is a complex and multifaceted concept [1,2,3,4,5,6,7]. In sports, 'talent' refers to adolescents who have athletic skills, passion, and character [5,8] and the potential to progress to and maintain elite-level performance [9,10]. Talent identification is the process of recognising athletes with potential to excel in a particular sport through assessment. It entails predicting performance over various periods of time by assessing potential talents' physique, physiological performance, psychological attributes, and sport-specific ability either alone or in combination [3,4,5,6,7]. This study compared the anthropometric and physiological performance of Hong Kong young athletes with their Sichuan and Singapore counterparts to provide insights into talent screening parameters for National Sports Associations and head coaches' reference. We hypothesised that the athletes' anthropometry and physiological performance would differ significantly between the three locations because of environmental factors, training methods, and cultural influences uniquely affecting athletic development in each region.

Methodology

A cross-sectional comparison study between Hong Kong, Singapore, and Sichuan young athletes was performed. Data were collected from 520 athletes (246 female and 274 male) aged 13–15 years from the Hong Kong Sports Institute, Sichuan Olympic Sport School, and Singapore National Youth Sports Institute from November 2023 to February 2024 (Table 1). These athletes were training across 25 sports, typically for at least 8 h per week. They were assessed for nine testing items, namely height, weight, sitting height, medicine ball throw, handgrip, vertical jump, 40-m sprint, 505 agility, and 2400-m run. The predicted peak height velocity of each athlete was generated using sex-specific equations (Moore-1) [11] and their height and sitting height parameters. A one-way analysis of variance (ANOVA) was used to determine the differences between Hong Kong, Sichuan, and Singapore young athletes. The a priori alpha level was set at $p \leq 0.05$.

Table 1. Distribution of athletes in Hong Kong, Sichuan, and Singapore

Age (years)	Male			Female		
	13	14	15	13	14	15
Hong Kong	30	30	30	30	30	26
Sichuan	29	32	31	31	28	29
Singapore	42	31	19	23	33	16

Results

In the 14-year age group, Hong Kong male athletes were significantly taller than Sichuan and Singapore male athletes ($p = 0.002$). In the 15-year age group, Sichuan male and female athletes were significantly taller than their corresponding Hong Kong and Singapore counterparts (male: $p = 0.009$; female: $p = 0.001$) (Table 2). The peak height velocity trendlines of Sichuan female athletes were higher than those of Hong Kong female athletes across the 13-, 14-, and 15-year age groups (Figure 1). The overall 2400m run of Sichuan athletes were faster than Hong Kong athletes, with the difference being significant among female athletes in the 14-year ($p = 0.001$) and 15-year ($p = 0.000$) age groups and among male athletes in the 15-year age group ($p = 0.000$) (Table 3). Hong Kong female athletes were significantly heavier than Sichuan female athletes in the 14-year age group ($p = 0.003$) (Table 4). Overall, the medicine ball throws of Hong Kong and Singapore athletes were farther than those of Sichuan athletes, with the difference being significant among male athletes in the 13-year ($p = 0.000$), 14-year ($p = 0.000$), and

Table 2. Heights of Hong Kong, Sichuan, and Singapore athletes

Age (years)	Male (cm) (mean $\pm$ SD)			Female (cm) (mean $\pm$ SD)		
	13	14	15	13	14	15
Hong Kong	164.74 $\pm$ 9.09	172.87 $\pm$ 6.77	174.21 $\pm$ 8.23	158.31 $\pm$ 7.04	161.23 $\pm$ 5.44	161.08 $\pm$ 7.81
Sichuan	159.88 $\pm$ 10.68	165.91 $\pm$ 8.49	175.84 $\pm$ 7.78	161.55 $\pm$ 7.57	162.31 $\pm$ 5.82	166.47 $\pm$ 6.08
Singapore	159.83 $\pm$ 8.57	168.17 $\pm$ 6.56	168.46 $\pm$ 7.92	157.97 $\pm$ 5.74	159.77 $\pm$ 5.39	161.68 $\pm$ 4.09
(p-value)	> 0.05	0.002	0.009	> 0.05	> 0.05	0.001

Table 3. The 2400-m run results of Hong Kong and Sichuan athletes

Age (years)	Male (seconds) (mean $\pm$ SD)			Female (seconds) (mean $\pm$ SD)		
	13	14	15	13	14	15
Hong Kong	689.76 $\pm$ 97.29	643.31 $\pm$ 73.70	724.07 $\pm$ 113.24	801.76 $\pm$ 139.36	828.15 $\pm$ 124.07	836.09 $\pm$ 84.16
Sichuan	674.55 $\pm$ 112.80	644.09 $\pm$ 142.67	609.03 $\pm$ 113.70	784.35 $\pm$ 138.81	707.36 $\pm$ 134.02	656.52 $\pm$ 60.53
(p-value)	> 0.05	> 0.05	< 0.001	> 0.05	0.001	< 0.001

Remark: The Singapore National Youth Sports Institute does not provide this set of data.

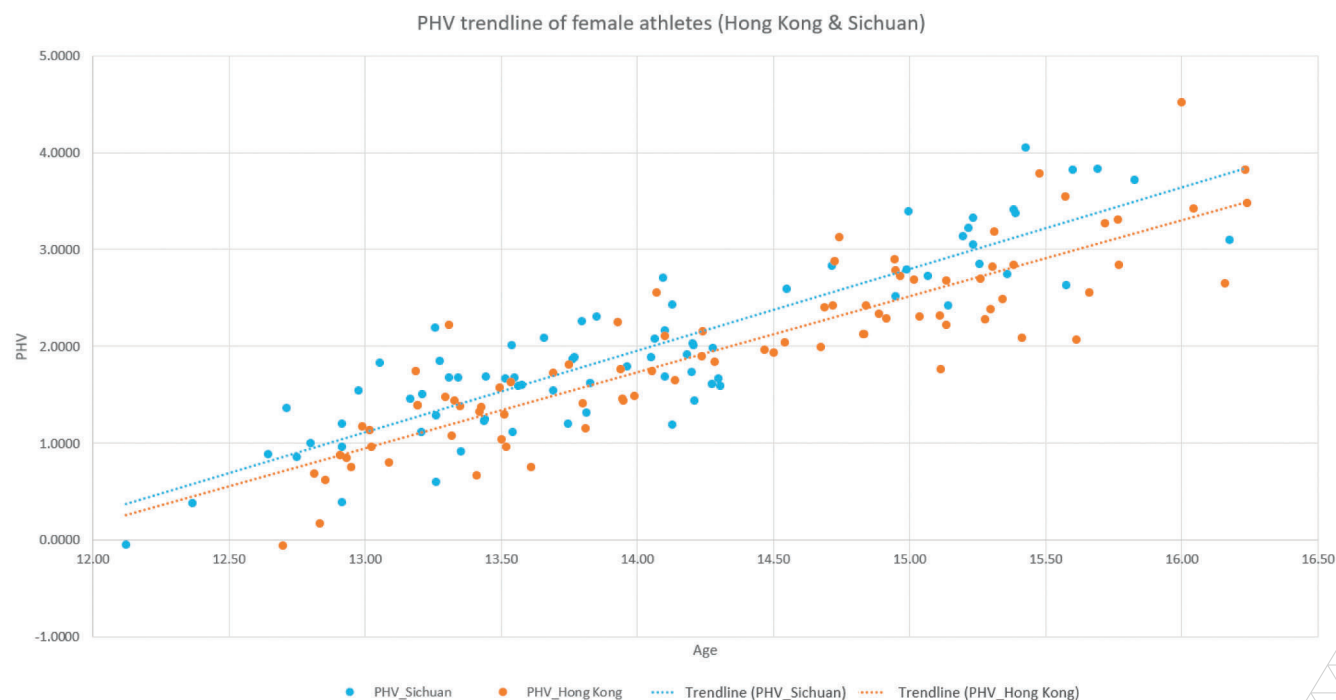


Figure 1. Peak height velocity trendlines of female athletes of Hong Kong and Sichuan

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Results (Cont'd)

15-year ($p = 0.001$) age groups and among female athletes in the 13-year ($p = 0.002$) and 14-year ($p = 0.000$) age groups (Table 5).

Discussion

The 2400-m run test results demonstrated that Sichuan athletes had better cardiovascular endurance and were lighter than Hong Kong athletes. These differences may be explained by the fact that Sichuan athletes are required to undergo cardiovascular training twice per week, whereas Hong Kong athletes perform cardiovascular training only once a week.

The results of the medicine ball throw test, which assesses athletes' upper limb explosive power [12], were better for Hong Kong and Singapore athletes than for Sichuan athletes. This difference may be related to the characteristics of the sports in which the athletes were undergoing training. Sichuan athletes mainly trained in martial arts and rope skipping, which is more focused on cardiovascular endurance and lower limb exercise. Hong Kong athletes mainly trained in table tennis, badminton, and rowing, while Singapore athletes mainly trained in water sports and netball. The sports in which Hong Kong and Singapore athletes participated place high demands on upper limb strength. This explains why Hong Kong and Singapore athletes performed better in the medicine ball throw test than did Sichuan athletes.

The peak height velocity trendlines of Sichuan female athletes were higher than those of Hong Kong female athletes in the 13–15-year age groups. This may explain why Sichuan athletes were taller than Hong Kong athletes. Factors influencing height in teenagers include genetics, nutrition, physical activity, sleep, and environment [13,14]. Sichuan athletes stay in a sports

boarding school and are required to strictly follow daily training and life schedule. They also have to follow a strict sleep schedule, a controlled diet, and sport-specific skills and fitness training every day, which might be beneficial for their physical growth and may have contributed to the high peak height velocity and height.

This study has some important limitations. First, all three institutions agreed to use standard testing protocols and equipment for this study to ensure a high data quality. The data quality can be further improved through a prior seminar and testing workshop to standardise the testing procedures of each institution in a future study. Second, most of the tests were performed outdoors and thus might have been affected by environmental factors due to variations in the climate across the three testing locations. To minimise the effect of the environment, organising tests early in the morning or evening in summer is recommended to ensure similar environmental conditions across the three testing locations.

Conclusion

The study revealed significant differences in the anthropometric and physiological performance of Hong Kong, Singapore, and Sichuan adolescent athletes. Several factors, including lifestyle, training plan, and the sports in which the athletes receive training, may affect the growth and overall development of adolescent athletes and should be investigated in a future study.

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Table 4. Weights of Hong Kong, Sichuan, and Singapore athletes

Age (years)	Male (kg) (mean $\pm$ SD)			Female (kg) (mean $\pm$ SD)		
	13	14	15	13	14	15
Hong Kong	51.17 $\pm$ 10.06	60.57 $\pm$ 6.41	64.59 $\pm$ 11.01	48.81 $\pm$ 9.01	54.98 $\pm$ 8.25	54.64 $\pm$ 10.56
Sichuan	52.40 $\pm$ 15.11	54.38 $\pm$ 9.85	58.88 $\pm$ 8.34	51.69 $\pm$ 10.81	48.53 $\pm$ 6.05	56.72 $\pm$ 12.58
Singapore	46.71 $\pm$ 7.78	56.66 $\pm$ 9.44	58.78 $\pm$ 14.76	48.89 $\pm$ 7.40	51.24 $\pm$ 5.96	51.54 $\pm$ 9.06
(p -value)	> 0.05	> 0.05	> 0.05	> 0.05	0.003	> 0.05

Table 5. Medicine ball throw test results of Hong Kong, Sichuan, and Singapore athletes

Age (years)	Male (cm) (mean $\pm$ SD)			Female (cm) (mean $\pm$ SD)		
	13	14	15	13	14	15
Hong Kong	592.21 $\pm$ 135.98	679.26 $\pm$ 98.90	721.74 $\pm$ 119.64	667.64 $\pm$ 125.30	661.01 $\pm$ 123.53	672.76 $\pm$ 132.80
Sichuan	470.00 $\pm$ 116.97	484.06 $\pm$ 101.48	597.42 $\pm$ 133.75	561.29 $\pm$ 129.13	517.14 $\pm$ 117.10	629.38 $\pm$ 136.31
Singapore	591.74 $\pm$ 138.49	720.35 $\pm$ 126.72	722.42 $\pm$ 148.26	649.57 $\pm$ 88.72	711.91 $\pm$ 141.23	725.94 $\pm$ 95.91
(p -value)	< 0.000	< 0.000	0.001	0.002	< 0.000	> 0.05

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