Fitness Profile among Malaysian Netball Players
馬來西亞投球選手的體適能

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Abstract

The purpose of the study was to determine the fitness performance among Malaysia top netball players, and to compare this study result with others studies or norm. The fitness variables measured were aerobic and anaerobic capacity, leg strength, agility, leg power and sprint ability. Besides that, this study was also carried out to determine whether there was any significant difference in these variables among netball players at different playing positions. A total of 52 Malaysian national netball players were chosen to be the subjects in this study. The 12-minute run, 8 x 35-metre runs, isokinetic leg strength test, SEMO agility test, and the 25-metre sprint test were used to measure the above fitness parameters. Malaysian netball players were reported to have lower aerobic and anaerobic capacity, leg strength, agility, and 25-metre sprint as compared to other countries' netball players. Nevertheless, Malaysian netball players were found to have better leg power and acceleration as compared to other countries' netball players. The center netball players were reported to be superior in VO_2 max, anaerobic, and agility tests, while the defenders were found to be superior in leg strength, leg power, and sprint tests.

Keywords: Netball players, fitness parameter, playing position

摘 要

本文旨在探討馬來西亞女子投球選手的體能狀況，並與同類研究進行比較及分析.

Introduction

Netball is a popular contact game in Malaysia with the most female participation (Aminah, 1993; Ten, 1995). Although the game has been in Malaysia for a long time, Malaysians only became seriously interested in it from the 1980s. Furthermore, research or studies into the sport has been mainly from textbooks or coaching manual (Steele, 1990). Therefore, there has been little research into the fitness components required for the game. This lack of knowledge, especially in fitness *vis-a-vis* playing position has made it a much needed void to fill. Until today, there has been no proper assessment of the selection process used. Thus, research to determine fitness parameters is needed to set suitable criteria for selection. Therefore, the objective of this study was to determine the fitness components among Malaysian national netball players based on playing positions. The fitness components measured were aerobic and anaerobic capacity, leg strength, agility, power, and sprint ability.

Methods and Procedures

Subjects

A total of 52 elite Malaysian netball players were chosen for this study. The subjects mean age was 19.12±3.29 years old. They were representatives of the Milo Malaysian-Singapore Series Games held in 1998. The subjects were divided into their playing positions of attack, center, and defence as suggested by Chad and Steele (1991). The number of subjects at different playing positions of attack, center, and defence were 16, 14, and 22 players respectively.

Procedure and Instrumentation

Table I showed the description and parameters measured in the tests that had been used to measure tested fitness components. The test was carried out at the University Putra Malaysia Physical Education laboratory and gymnasium with the assistance of trained Physical Education students and physiotherapists from Malaysia National Sport Institute. In order to control possible inter-tester errors in the measurements, each tester throughout the testing period consistently measured the same variables.

Table 1. Test Descriptions and Parameters Measured in the Fitness Tests.

Test	Description	Parameters Measured
1. VO_2 max	12-minute run	Distance (m)
2. Anaerobic	8 x 35-metre runs	Time (seconds)
3. Leg Strength	Leg extension and flexion strength test	Peak Torque (N.m) for both legs at 60^0 per sec
4. Agility	SEMO agility test	Time (seconds)
5. Leg Power	Vertical Jumps	Distance jumped (cm)
6. Sprint	5, 10, and 25 m runs	Time (seconds)

Statistical Analysis

Aerobic and anaerobic capacity, leg strength, agility, power, and sprint ability between different playing positions were identified using one-way analysis of variance (ANOVA). If the result was significant, a post hoc analysis was carried out using the Scheffe test to determine the level of significant (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975; Pallant, 2001).

Results

Presented in Table 2 were the results for the test. One-way ANOVA showed significant differences in both leg strength test (right and left leg extension strengths) among the playing positions with $F(2,46)=4.10$, ($p<.02$) and $F(2,46)=6.10$, ($p<.01$), respectively. The detailed Scheffe test indicated that the only significant difference was found between the center and defence. The mean difference for right leg extension strength between the two groups was 24.48 N.m. For the left leg too, the only significant difference was found between the center and defence with a mean difference of 28.93 N.m.

There was no significant difference in VO_2 max, anaerobic capacity, leg strength test (right and left leg flexion strengths), agility, power, and sprint ability among

the different playing positions. The center was found to be superior in three tests. They were reported to have the highest VO_2 max, anaerobic capacity, and agility level as compared to the defender and attacker position netball players. Meanwhile, the defender was found to be superior in the three other tests. The tests were leg strength test, leg power, and sprint test.

Table 2. VO_2 Max, Anaerobic, Leg Strength, Agility, Leg Power, and Sprint Results based on Playing Position.

Test	Playing Positions			Overall Mean	F Value
	Attack	Center	Defense		
VO_2 max (ml/kg/min)	37.39±5.48	40.32±3.69	38.14±4.13	38.49±4.59	1.46 (P>.25)
Anaerobic (%)	12.58±5.59	10.58±6.26	13.96+8.80	12.57±7.17	0.78 (P>.47)
Leg Strength (N.m)					
RL(E)	159.21±29.08	144.86±14.49	169.33±26.94	159.45±26.33	4.10 (P<.02) *
RL(F)	86.93±17.30	83.14±11.92	95.86±18.83	89.67±17.28	2.70 (P>.08)
LL(E)	146.64±24.15	133.93±15.98	162.86±28.65	149.96±26.83	6.10 (P<.01) *
LL(F)	91.79±15.00	83.00±8.56	92.05±15.12	89.39±13.88	2.18 (P>.13)
Agility (seconds)	13.07±0.56	12.74±0.49	12.85±0.70	12.89±0.61	1.16 (P>.32)
Leg Power (seconds)	47.38±5.11	46.00±5.41	48.73±3.98	47.58±4.79	1.43 (P>.25)
Sprint (seconds)					
5 Meters	1.18±0.18	1.15±0.21	1.12±0.19	1.15±0.19	0.60 (P>.55)
10 Meters	2.06±0.23	1.99±0.26	1.94±0.23	1.99±0.24	1.08 (P>.35)
25 Meters	4.40±0.37	4.25±0.37	4.20±0.35	4.27±0.37	1.43 (P>.25)

Note: * Significant at $p < .05$.
Legends: RL(E) – Right Leg Extension Strength LL(E) – Left Leg Extension Strength
RL(F) – Right Leg Flexion Strength LL(F) - Left Leg Flexion Strength

Discussion

Malaysian netball players' overall VO_2 max and anaerobic results indicated that they have lower VO_2 max and anaerobic capacity as compared to others countries' netball players. The mean VO_2 max of 38.49+4.59ml/kg/min was found to be lower as compared to elite Australian netball player of 44.8ml/kg/min (Withers & Roberts, 1981). The center had the highest mean VO_2 max of 40.32ml/kg/min. According to the norms of Sharkey (1990), they were in the Active category. A good VO_2 max level is very important and it is essential requirement for a good netball player especially the center who is the link between attacker and defender. Therefore, a high VO_2 max would not only ensure a more active attack and defence, but also enable the center to better cover larger area than players in the other positions (Chad & Steele, 1991). Besides that, the center was also reported to have the best anaerobic level of 10.58%. The good anaerobic capacity of the center was important for their constantly active play and coverage of the largest court area (Chad & Steele, 1991; Ten, 1995). Thus, they need both good VO_2 max and anaerobic capacity not only for playing longer, but also to recover faster in the short rests they can snatch in between plays.

The Malaysian netball players were found to have adequate leg extension and flexion leg strength as compared to other countries' netball players. The defence had the strongest legs – both legs during extension and flexion - followed by the attack and center. Steele (1990) reported similar results, and also found out that

the subjects with good leg power also had good leg strength. Where else, Steele (1990), Bret, Rahmani, Bufour, Messonnier, and Lacour (2002), and Young, James, and Montgomery (2002) agreed that good leg strength contributes to other fitness components, such as agility, anaerobic capacity, and jumping power.

The overall agility results showed that the Malaysian netball players were advanced intermediate in agility level based on the SEMO agility norm (Johnson & Nelson, 1986). Only six of the overall 52 players were classified as advanced. Of the remainder, 24 were advanced intermediate, 19 intermediate and the remaining three advanced beginner. The Johnson and Nelson (1986) SEMO Agility Norms were based on the performance of students from two American universities, and not on elite athletes. Therefore, the agility level among the netball players in this study was found to be fair. The center was the most agile, followed by the defence and then attack. By the norms of Johnson and Nelson (1986), the center and defender were advanced intermediate, and the attack was only intermediate.

Malaysian players could jump higher than other countries' netball players. The ability to jump gives the players an advantage in passing and catching high balls (Bale & Hunt, 1986). However, the good leg power of the Malaysians was negated by their lack of height (Malaysian Netball Association, 1998). The sheer height of the foreign players is more than overcame the Malaysian advantage in jumping. The Malaysians could only jump less than 5 cm higher, while the foreign players were generally can jump 5 cm higher (Soh, Ruby, Mohd Nor', & Zaliha, 2003). The defence had the best jumping ability with a mean height of 48.73 cm. Similarly, Bale and Hunt (1986) and Chad and Steele (1991) also found the defence in the New South Wales State Netball League to be the most powerful jumpers and has more advantages if they are bigger, stronger, and can jump better.

The sprint of Malaysian netball players over 5 and 10-meters were better than those of the subjects of Young, Mclean and Ardagna (1995). The overall times taken for the two distances were 1.15 and 1.99 seconds, respectively. Nevertheless, the Malaysians netball players were found to have poor sprint ability for the distance between 10 to 25-meters. Their initial acceleration (0-10 meters) was good vis-à-vis other countries' netball players, but as the distance increased, they were unable to sustain their acceleration even to 25-meters. As a result, their speed over 25 meters was slower than those from other studies. The defence were the fastest with 1.12 and 1.94 seconds, and the center second fastest with 1.15 and 1.99 seconds. The attacks were the slowest with 1.18 and 2.06 seconds. All these times were better than the times recorded by Young et al. (1995), but as the distance increased to 25-metre, the sprint time of the defence, center, and attack netball players were reported to be slower.

Conclusions

The Malaysian netball players not only had lower VO_2 max as compared to other countries' netball players but the VO_2 max value was found to be lower as compared to healthy Malaysian females as reported by Singh, Singh, and Sirisinghe (1995). Their VO_2 max level was, therefore, found to be inadequate for elite or national netball players. Besides that, the Malaysian netball players were also reported to have lower anaerobic capacity, agility, and overall sprint ability as compared to other countries' netball players or norm.

Malaysian netball players were reported to have better ability to jump vertically and to accelerate for distance less than 10-metre as compared to other countries' netball players. However, the good leg power of the Malaysians was negated by their lack of height. The sheer height of the foreign players is more than overcame the Malaysian advantage in jumping. The Malaysians could only jump less than 5 cm higher, while the foreign players were generally more than 5 cm taller. For their sprint ability, the Malaysian netball players were reported to have good initial acceleration (0-10 meters) as compared to other countries' netball players, but as the distance increases, they were unable to sustain their acceleration even to 25-meters. As a result, their sprint ability over 25-meters was slower than those from other studies. Hence, the Malaysian netball players still have a lot to improve in term of their fitness profile before they are really fit for the game.

References

Aminah, M. S. (1993). *Bola Jaring (Netball).* Kuala Lumpur: Penerbitan Fajar Bakti Sdn. Bhd.

Bale, P., & Hunt, S. (1986). The physique, body composition and training variables of elite and good netball players in relation to playing position. *The Australian Journal of Science and Medicine in Sport, 18*(4), 16-19.

Bret, C., Rahmani, A., Bufour, A. B., Messonnier, L., & Lacour, J. R. (2002). Leg strength and stiffness as ability factors in 100 m sprint running. *Journal of Sports Medicine and Physical Fitness, 42*(3), 274-281.

Chad, E. K., & Steele, J. R. (1991). Physiological characteristics of skilled netball players: Coaches' reports. *Australian Sports Commission, April*, 1-13.

Johnson, B. L., & Nelson, J. K. (1986). *Practical measurement for evaluation in physical education* (4th ed.). Edina: Burgess Publishing.

Malaysia Netball Association. (1998). *Kuala Lumpur '98 Commonwealth Games.* Kuala Lumpur: Wisma OCM.

Nie, N. H., Hull, C. H., Jenkins, J. G., Steinbrenner, K., & Bent, D. H. (1975). *SPSS statistical package for the social sciences* (2nd ed.). New York: McGraw-Hill Book Company.

Pallant, S. (2001). *SPSS survival manual: A step by step guide to data analysis using SPSS (version 10).* Illinois: Allen and Unwin.

Sharkey, B. J. (1990). *Physiology of fitness* (3rd ed.). Illinois: Human Kinetics Books.

Singh, R., J., S. H., & Sirisinghe, R. G. (1995). Cardiopulmonary capacities of Malaysian females. *Singapore Medical Journal, 36*(2), 169-172.

Soh, K. G., Ruby, H., M Nor' C. N., and Zaliha, O. (2005). Leg power amongMalaysian netball players. *African Journal for Physical, Health Education, Recreation and Dance (AJPHPER)*, 9(1), 32-39.

Steele, J. R. (1990). Biomechanical factors affecting performance in netball : Implications for improving performance and injury reduction. *Journal of Sports Medicine, 10*(2), 88-102.

Ten, H. (1995). *Panduan mengajar bola jaring (Method to teach netball).* Selangor Darul Ehsan: Penerbitan Fajar Bakti Sdn. Bhd.

Withers, R. T., & Roberts, R. G. D. (1981). Physiological profiles of representative women softball, hockey and netball players. *Ergonomics, 24*(8), 583-591.

Young, W., Mclean, B., & Ardagna, J. (1995). Relationship between strength qualities and sprinting performance. *Journal of Health, Physical Education and Recreation, 35*(1), 13-19.

Young, W. B., James, R., & Montgomery, I. (2002). Is muscle power related to runningspeed with changes of direction? *Journal of Sports Medicine and Physical Fitness, 42*(3), 282-288.

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