

THE DEVELOPMENTAL PATHWAYS OF MALAYSIAN ELITE YOUTH BADMINTON PLAYERS

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ABSTRACT

This study examine the developmental factors of Malaysian elite youth badminton players. The participants were badminton players from the national back-up players (n = 16) and youth state players (n = 20) from three states in Malaysia, chosen based on their performance in previous Malaysian Games. Retrospective analysis of the participants' type and amount of badminton related practice activities throughout their career showed that although the national players achieved some badminton performance milestones later than the state players, further examination into their accumulated hours in structured and unstructured badminton practice activities showed almost similar patterns in their engagement in those activities with more emphasis on structured practice from the beginning of their career. It suggests that both the national youth and state badminton players conform to the early specialization pathway.

Keywords: Developmental pathways; deliberate play and practice; youth badminton players.

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1. INTRODUCTION

Malaysia have a proud history of producing world class players in badminton. The country have won the prestigious Thomas Cup (elite men's team competition equivalent to the soccer World Cup) five times and runner-up nine times. Badminton is considered the most popular racket sport in Malaysia. There has also been an increased effort in the development of elite players in the country since the sport was included in the Olympics. Structured training under qualified supervision are organized in training centers (i.e., national and state academies). Players selected into these centers vary from different age groups and performance level. Players usually progress from the state level centers to the national academy based on their performance. However, equally important is how these players developed before being chosen.

Apart from the various organizations (e.g., National Sports Council and the Badminton Association of Malaysia) effort to develop the sport in the country, the Malaysian government through the Ministry of Education, in realizing the importance of long term development of sport, has implemented a 1Pupil1Sport program (<http://www.moe.gov.my/v/1-murid-1-sukan>). The objective was to encourage every pupil to participate in at least one sport activity in school. This objective is part of the National Philosophy of Education which aims to holistically develop the intellect, physical, emotion and spiritual quality of the child. The school children are introduced to play game/sports/activities while at primary school. Practice on specific game will start as early as at age of 8-9 years old. Formal inter school competitions commence at under 12 years level although there are few but emerging competitions for children under 10 years of age. When children begin to concentrate on one sport, they are termed to specialize early, where they will undergo structured training by an adult (usually a coach) at school, district and state level.

Structured training under qualified supervision are organized in training centers (i.e., national and state academies). Players selected into these centers vary from different age groups and performance level. Players usually progress from the state level centers to the national academy based on their performance. However, equally important is how these players developed before being chosen. The type and amount of sport-related practice activities

engaged in could provide insight into the progress of their career. Research into the development of elite athletes has consistently showed that it takes about 10 years of incremental and systematic training before achieving success [1]. The developmental pathways of elite badminton players in Malaysia need to be empirically examined in order to identify the developmental activities engaged in during their childhood and adolescence. Data on the developmental activities of elite youth athletes could provide insight on the current sport development programs in the country. Research has shown that there is a need to specialize early in order to achieve expert performance level in sport. Early specialization in sport is based on the deliberate practice theory [2]. Deliberate practice is a highly structured, purposeful form of practice undertaken with the aim of improving performance. This activity requires concentration, feedback and is not inherently enjoyable and furthermore an adequate amount of high quality training is the only necessary ingredient to achieve expert performance [2]. The deliberate practice theory in sport was first examined in wrestling [3]. The researchers chose the individual sport as it provided a comparable study to [2] original research in expert musicians. The amount of time engaged in sparring-with-others differentiated the most skilled wrestlers from lesser skilled groups and the activity was rated as most relevant for improving performance. The international level wrestlers accumulated almost 6,000 hours of that activity, averaging 26 hours per week, compared to the club-level wrestlers (3571 hours) after 10 years of involvement. The deliberate practice theory was subsequently extended to the study of team sports [4]. The study on Belgian soccer players revealed although both the international and province players started playing soccer at 6 years of age, the international players accumulated significantly more hours in individual practice ($M = 5$ hours/week) at 12 years of age and team practice ($M = 9$ hours/week) at 16 years of age. The findings suggest that coach-led team practice constitute deliberate practice [4].

Recent study examined the performance milestones of elite adult, youth/development and recreational Australian netball players apart from their practice histories [5]. The researchers found the developmental players achieved a number of milestones earlier than the adult and recreational players. The youth players started netball specific training, individual practice and non-netball specific training (e.g., physical fitness) much earlier than both the elite adult

and recreational players. The researchers concluded that the early start in sport specific experiences could have contributed to the attainment level of the developmental players. The increased effort by the sport and education governing bodies in promoting and developing sport from young contributed to the results as well. The adult elite athletes did not have the opportunity for the structured development programs during their developmental years.

Findings from related literature have suggested that early diversification is more economical and effective in developing elite athletes [6-8]. It has been reported that participating in other sports and modified fun games (e.g., backyard games) contributed to the development of elite tennis players and rowers (n = 15) during their early years (6 to 12 years of age) [6]. Previous study defined those activities as deliberate play [6-7, 9]. Deliberate play is informal game-like activities participated for the main purpose of enjoyment and immediate gratification rather than improving performance. The researchers subsequently proposed a talent development model for sport called early diversification where the athlete progresses through three distinct chronological stages called the sampling (ages 6-12 years), specializing (ages 13-15 years) and investment years (ages 16+ years). Sports related activities shift from deliberate play in the sampling years to deliberate practice in the investment years. In the sampling years, expert athletes engaged in various sports with the main focus on deliberate play activities. In the specializing years, they engaged in fewer sports and begin concentrating on deliberate practice in their main sport. In the investment years, they are fully engaged in only one primary sport. These researchers have also suggested that deliberate play and participation in other sports early in the career may lessen the amount of deliberate practice hours needed in the primary sport to achieve expert performance. The various pathways of development in sport have been investigated empirically and subsequently conceptualized through the Developmental Model of Sport Participation [9]. By examining the empirical characteristics of elite athletes such as their performance milestones and practice histories, it is hoped that the developmental pathways undertaken by these athletes could be identified.

Previous studies on the effect of deliberate practice or early specialization on expert performances were mostly conducted on the team sports such as football, basketball and netball rather than individual sports like badminton, tennis or squash. This study attempt to

investigate the developmental pathway of badminton, which in some aspects might have differential approach towards the accumulated hours of training compared to the team sport athletes. Previous studies examined the development of elite athletes up to the age of 18 years old. Further developmental patterns of the elite athletes after adolescent could be teased out [10]. This study improved the previous studies by examining the hours engaged in badminton related activities from 19 to 21 years of age. Furthermore, the lack of consensus as to what activities that children should engage in during childhood and early adolescence that lead to expert performance in the target sport in adulthood makes it difficult for coaches and administrators to plan development program for future generations of elite athletes. Although the physical and physiological attributes of elite and sub-elite Malaysian badminton players have been examined previously, no research has been conducted to investigate on what badminton related activities contribute to the development of the players' performance [11].

The aim of this study was to examine the developmental pathways undertaken by the elite badminton players. It is suggested that the elite national players would begin playing badminton early (achieving earlier milestones) and engaged in significantly more hours of structured practice when they reached 15 years of age. In terms of differences in the types of badminton related activity, it was expected that during childhood (defined as 6 to 12 years of age) the developmental activities of the national academy players would follow the clear tenets of the early specialization engagement pathway where the players would engaged in high amount of deliberate practice in their primary sport and low amount of other-sports compared to their state-level counterparts. In the early adolescence (defined as 13 to 15 years of age) and late adolescence onwards (defined as 16 to 18 years of age) and early adult (19 to 21 years), both groups are expected to engage in early specialization pathway, where high amount badminton practice and low amount of other sports.

2. MATERIALS AND METHODS

2.1. Participants

A total number of 36 male badminton players aged between 16 to 21 years old ($M = 20.7$ years old, $SD = 2.1$) were selected to participate in the study. Participants were i) elite

Malaysian back-up badminton players that are currently training and playing under the national program and ii), state youth players competed the Sukan Malaysia (SUKMA) level. Participants for this study involved players from the national badminton academy and three purposively selected state-level academies. Prior permission was obtained from the relevant authorities (i.e., Ministry of Education, Badminton Association of Malaysia and officials of the state badminton associations).

2.2. Research Design

This study was a descriptive research design, requiring the participants to recall the amount of hours engaged in badminton related activities from the start of their career using the Participation History Questionnaire (PHQ) [10]. The questionnaire was used to obtain the data of the badminton players on the hours engaged in badminton related activities. There were two sections in the questionnaire, where the first section was the demographic information on age achieved in badminton related milestones. Players were required to recall on their involvement in badminton, their first start of playing, their age when they start to being supervised, the starting age of joining competition and the start of joining high performance program. Second part consists of their engagement in structured and unstructured badminton related practice activities.

Altogether, four badminton activities are listed: ‘match-play/competition’ (organized competition usually between two teams supervised by adults and engaged in with the intention of winning), ‘coach-led practice’ (organized practice supervised by coach/s or adult/s engaged in with the intention of performance improvement), ‘individual practice’ (practice alone engaged in with the intention of performance improvement) and ‘play’ (play-type games with rules supervised by oneself/peers engaged in with the intention of fun and enjoyment such as after school play). These activities are chosen based on previous research in which retrospective questionnaires were used [10] and to match the recommendations proposed by prior research [12], as well as the opinions of two qualified Malaysian badminton coaches. Participants provided the number of hours per week and weeks per year in the activities for each year. They also provided the number of weeks from each year that they were injured and unable to take part in badminton activity.

2.3. Procedure

The process of data collection started with obtaining the approval from the Badminton Association of Malaysia (BAM), Ministry of Education for players who were still schooling and the officials from the selected state SUKMA teams. The researchers visited the selected centres to collect the data with the assistance of the badminton coach of the respective academies. Verbal instructions were provided to participants regarding the purpose of the questionnaire. Participants were briefed on how to complete the first section of the questionnaire before commencing. The estimated duration for the participants to complete the questionnaire was 1 to 1.5 hours.

2.4. Data Analysis

Descriptive statistics of the mean (M) and standard deviation (SD) of the players chronological age and age achieved in the badminton performance milestones and number of hours logged in badminton practice (structured and unstructured) activities analysis.

Independent sample t-tests were used for the analysis of participants' age in achieving badminton related milestones such as their starting age for playing badminton, supervised badminton training and badminton competition participation from school up to international level. Repeated Analysis of Variance of two groups (national back-up, state players) and the amount of hours engaged in badminton activities in four age range (6-12, 13-15, 16-18, 19-21 years of age) was used to analyze the accumulated hours of the four activities (competition, coach-led practice, individual practice and play in between) [14-15]. The accumulated hours in badminton activity for each year between the age ranges stated were calculated by multiplying hours per week by weeks per year minus weeks off injured per year. Any significant main effects were followed up with pair-wise comparisons. The Bonferroni correction method was used to adjust the alpha level required for significance for post hoc pair-wise comparisons only.

3. RESULTS

A total of 16 national back-up badminton players (M = 22.1 years of age; SD = 2.0) and 20 state youth players (M = 20.0 years of age; SD = 1.3) participated in the study. The data of

four national back-up players were incomplete as they were away for national assignment, hence they were excluded from the study.

3.1. Milestones

Separate independent t-tests conducted on the mean age of badminton related milestones achieved by the participants found only age first started i) supervised training, ii) non badminton training (e.g., physical fitness), iii) competed at school level and iv) competed at international level revealed significant differences between the national and state youth players. The state players achieved those milestones much earlier than the national players. No significant differences were found in other badminton-related milestones.

Independent sample t-test $t(34) = 2.97$, $P = 0.005$ comparing the age achieved in the badminton-related milestones showed that the state players started engaging in supervised training much earlier ($M = 9.0$ years of age; $SD = 1.7$) than the national back players ($M = 11.0$ years of age; $SD = 1.8$). Similarly, t-test $t(34) = 1.69$, $P = 0.001$ comparing the age engaged in non-badminton training showed that the state players started engaged in that activity much earlier ($M = 10.0$ years of age; $SD = 1.3$) than the national back players ($M = 12.0$ years of age; $SD = 1.8$). Independent sample t-test on the start age of competing at school /club level $t(34) = 2.60$, $P = 0.001$ reported that the state players first competed at school/club level badminton competitions much younger ($M = 10.0$ years of age; $SD = 1.3$) than the national back players ($M = 12.0$ years of age; $SD = 1.8$). The final significant difference in badminton related milestone was the age first competed at international level. Independent t-test, $t(30) = 2.98$, $P = 0.006$. The state players participated in international competitions much earlier ($M = 15.0$ years of age; $SD = 2.1$) than the national players ($M = 16.8$ years of age; $SD = 1.1$).

Table 1. Comparison on age achieved on badminton related milestones between the national back-up and the state youth players

Milestones	State versus National Players		N	Mean (Years of Age)	Std. Deviation	P
	State	National				
Age first played badminton	State	20	20	7.8	2.1	P > 0.05
	National	16	16	8.4	2.6	
Age supervised training	State	20	20	9.0	1.7	P < 0.05*
	National	16	16	10.7	1.7	
Age first competition	State	20	20	10.2	1.3	P > 0.05
	National	16	16	11.0	1.8	
Age non-badminton training	State	20	20	9.9	1.3	P < 0.05*
	National	16	16	11.8	1.2	
Age compete at club/school	State	20	20	10.1	1.3	P < 0.05*
	National	16	16	11.4	1.8	
Age compete at district	State	20	20	11.4	1.4	P > 0.05
	National	16	16	11.9	1.4	
Age compete at state	State	20	20	11.4	1.4	P > 0.05
	National	16	16	12.4	2.3	
Age compete at national level	State	19	19	15.4	2.2	P > 0.05
	National	15	15	16.4	1.2	
Age compete at International	State	16	16	15.0	2.1	P < 0.05*
	National	16	16	16.8	1.1	

The average accumulated hours of engagement in structured and non-structured badminton activities as a function of chronological age range (i.e., 6-12, 13-15, 16-18 and 19-21 years of age) of the national back-up and state youth players were shown in Fig. 1. The comparison of the hours were analyzed in a 2 Groups (National vs. State) x 2 activities (structured vs. unstructured) at 4 age range (6-12, 13-15, 16-18 and 19-21 years of age) analysis of variance

(ANOVA) with repeated measures on the activities.

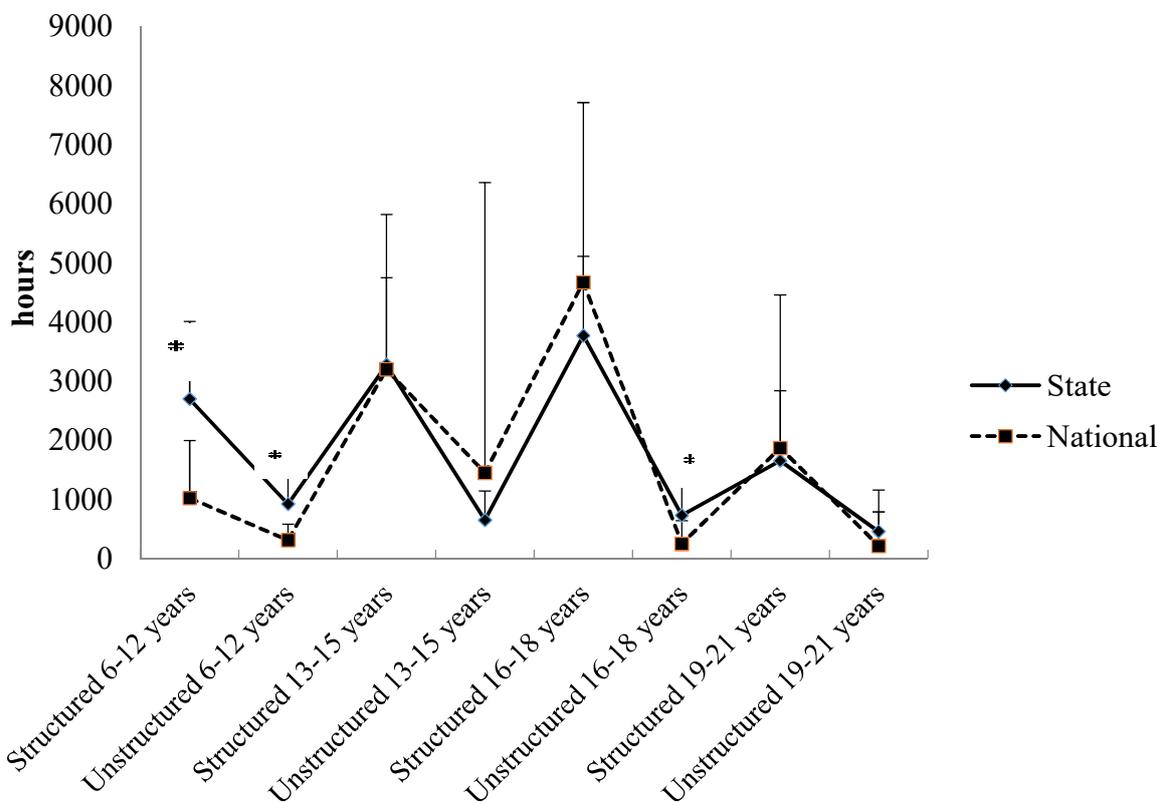


Fig.1. Hours accumulated in structured and non-structured badminton activities according to age range (6-12, 13-15, 16-18 and 19-21years of age)

There was no significant main effects on group, $F(1, 34) = 0.23, P = 0.63$. The average total hours accumulated by the state players in both structured and non-structured activities ($M = 14145.3, SD = 3443.4$) did not differ significantly with the national back-up players' ($M = 12967.7, SD = 10279.2$). There was a significant main effects for activities $F(7, 238) = 25.06, P = 0.001$. The participants engaged in more hours of structured activities ($M = 11105.67$ hours, $SD = 6251.03$) than the unstructured activities ($M = 2516.23$ hours, $SD = 3805.23$).

There was a significant group x activities interaction $F(7, 238) = 2.20, P = 0.04$. The national back up players' hours engaged in structured and unstructured activities differed significantly from the state players in certain age range. Table 2 showed the significant difference in the hours as a function of the age range.

The state players engaged significantly more hours in structured ($M = 2695.2$ hours, $SD = 1312.5$) and unstructured activities ($M = 920.8$ hours, $SD = 487.7$) from 6-12 years of age

compared to the national back-up players (M = 1019.4 hours, SD = 975.6) and (M = 309.1hours, SD = 271.1) respectively. The unstructured practice activities of the state players (M = 729.4 hours, SD = 620.2) compared to the national back-up players (M = 247.4 hours, SD = 391.6) in the 16-18 years range only. All other activities did not yield any significant differences.

Table 2. Comparison of hours engaged in structured and unstructured badminton activities according to age range between state and national back-up players

Badminton Activities	State versus National Players			P < 0.05
	Mean (Hours)	Std. Deviation		
Structured (Match+Coach) 6-12 years	State	2695.2	1312.5	P = 0.001*
	National	1019.4	975.6	
Unstructured (Individual+Play) 6-12 years	State	920.8	487.7	P = 0.001*
	National	309.1	271.1	
Structured (Match+Coach) 13-15 years	State	3273.2	1471.3	P = 0.914
	National	3197.8	2613.9	
Unstructured (Individual+Play) 13-15 years	State	649.5	492.9	P = 0.472
	National	1448.4	4903.9	
Structured (Match+Coach) 16-18 years	State	3767.3	1340.6	P = 0.242
	National	4667.3	3037.3	
Unstructured (Individual+Play) 16-18 years	State	729.4	620.2	P = 0.001*
	National	247.4	391.6	
Structured (Match+Coach) 19-21 years	State	1653.2	1183.6	P = 0.744
	National	1867.0	2588.8	
Unstructured (Individual+Play) 19-21 years	State	456.7	702.6	P = 0.268
	National	211.4	576.2	

4. DISCUSSION

The purpose of this study was to determine the developmental pathway of successful youth elite badminton players. The participants of this study were the 16 current national back-up squad and 20 state youth players selected from three states that participated in the last Sukan Malaysia (SUKMA) 2014. The researchers predicted the national back up players would achieved badminton related milestones earlier and engaged in more structured practice hours at a younger age compared to the state badminton players, hence conforming to the early specialisation pathway in line with the deliberate practice theory on the development of elite performance [2].

However, the hypothesis was rejected as the study found instead the state players achieved significant in certain badminton milestones earlier (i.e., first started supervised training, competed at school /club and international level) than the national back-up squad. These results partly contradicted previous findings where elite athletes commenced sport specific training much earlier than their lesser skill counterparts [5, 10]. No other significant differences were found on other performance milestones such as age participated in district, state and national level competitions. The researchers suggest that both groups are almost equally skilled and therefore achieved the performance milestones about the same time. The relatively early age of achievement in the badminton performance milestones also suggest that both the national and state players developed their skills through the early specialisation pathway. Further investigations into other factors such as the hours engaged in badminton related practice activities could perhaps tease out the different practice activities that differentiated the group.

Analysis into the hours engaged in structured and unstructured activities as a function of the different age range was conducted in order to examine developmental pathways as suggested by the Developmental Model of Sport Participation (DMSP) [7, 9].

The state players engaged in significantly more hours in both structured and unstructured practice activities in the 6-12 years of age range (sampling years) than the national back-up players. These data supported the badminton performance milestones achieved by the former earlier. The results suggest that the state players had a head start in their sport development

compared to the national players.

Another significant difference between state and national players was the unstructured practice hours at the 16-18 years (investment years), where the national players engaged in significantly lesser hours in those activities compared to the state players. This finding supported previous studies and conformed to the late specialisation pathway according to the DMSP [4-5, 10]. The interesting finding on rather high volume of the state players' involvement in unstructured practice at this stage could contribute to their current performance level when compared to their national counterpart. Elite athletes at this stage of career would have significantly reduced their unstructured activities and concentrated on the structured activities such as coach-led practice and match-play. Physically and physiologically, athletes at this stage would be able to sustain more volume in their training [13].

Subsequent data comparing the structured and unstructured activities in other age ranges (13-15, 16-18 and 19-21 years of age) did not yield any significant changes. However, the national back-up players accumulated more hours of structured activities in 16-18 and 19-21 years of age range compared to the state players. Again, these data suggest that the national players followed the late specialisation pathway.

An interesting finding from this study was the decreased in the number of hours of both groups in the structured and unstructured practice activities in the 19-21 years age range. The result contradicted the studies on expert musicians [2] and soccer players [4]. The researchers could not pinpoint the exact cause and could only speculate that probable reasons could range from the time the players spent in other activities such as continuing their tertiary education or vocation commitment, thus reducing their amount of their training time. Future studies could attempt to investigate the reasons for the reduced training hours as the particular age period is considered as critical for an athlete to attain apex performance level.

The overall finding from this study was mixed and the researchers suggest that the results should be interpreted with caution. Data from this study could not suggest with confidence that the elite national youth badminton players developed their talent through the late specialisation pathway when compared to the state players. The evidence were not compelling enough to support the late specialisation developmental pathway proposed in the

Developmental Model of Sport Participation, which suggest a high volume of unstructured play like activities in the early years before gradually reducing those activities with structured activities in the late adolescence [7, 9]. However, the data tend to suggest that both groups were more inclined to the early specialisation pathway. The reasons being both group engaged in higher volume of structured activities than unstructured activities from the onset of their career, thus satisfying the early specialisation pathway and conforming to the deliberate practice theory [2]. The reason to employ a within-group approach (i.e., comparing participants of almost similar skill level) rather than the normal between-group approach by certain studies [5] was to attempt to tease out finer possible factors that contribute to the development of expert athletes.

5. CONCLUSION

This findings from this study showed the elite Malaysian youth badminton players tend to develop through the early specialization pathway. Although the results may not be congruent with the findings from other sports, we conclude that the pathway undertaken by these athletes may be influenced by the cultural and socio-economic factors of the country. Badminton is identified as a sport that could potentially bring glory and success to the country. Both government and the sport governing body have increased their efforts to achieve the objective. Furthermore, there has been an increased in tournaments with lucrative prize monies, both locally and internationally. Debate will continue on whether the early specialization pathway is the recommended route to develop future badminton players.

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