

## Different Performance Characteristics among Students in Malaysia

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### ABSTRACT

The main aim of this study is to examine and define performance characteristics for the male students and female students in 3 types of school in Malaysia. A sample of 1083 students (male=625, Female 458) age between 13 years to 16 years participated in this study. The students are from 3 different types of school, namely National Sport School (n=300), State Sport School (n=333) and Normal School (n=450). There were 190 male and 110 female from National Sport School, 210 male and 123 female from State Sport School. Meanwhile, there were 225 male and 225 female from the Normal School. The students from National Sport School and State Sport School consists of young athletes. Meanwhile, the students from Normal School just ordinary students with various backgrounds. Height and weight measurement is to indicate students' anthropometry measurement. Furthermore, the students have been tested with 6 physical fitness tests to indicate their physical performances (standing broad jump, sit and reach, 30-meter sprint, 7 level sit-up, 10-meter shuttle run, bleep test). The results of this study show that anthropometry measurement and physical performance test can be used to discriminate between students in the different type of school (NSS, SSS, NS). Besides that, this study showed that there were different performances in the physical test among students, which can help to discriminate students into the different school.

**Keywords:** Physical Performance, Anthropometry, Discriminate

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### INTRODUCTION

A well-developed high performance system is important in the international 'battle for medals'. The high performance system should not only allow for a sustained level of superior performance but also for the continued development of talented athletes towards elite level (De Bosscher, Bingham, Shibli, Van Bottenburg and De Knop, 2008). Nowadays, the sports industry is considered to be a big business worldwide. Policymakers therefore, need to focus their attention on creating talent identification (TID) systems based on the culture of the nation. Most countries have a TID-system to identify talented athletes for their elite sport schools to assure that young athletes find their development (TDEV) in the right pathway to become a World Class Athlete. Although most TID-systems focused on physical performance characteristics of young athletes, there is a lack of systematic talent development processes to identify potential elite from outside a sport's participation base. The detection phase (TDET) with the selection process of high potentials in the schools is often the missing link (Pion, 2016). The Malaysian school system might offer a systematic approach although when selecting athletes for TDEV, the risk for de-selection is high. Indeed, a TDET and additional concept of talent orientation (TOR) should be implemented to guide the athletes with high potential towards a sport that fits their talent characteristics.

#### *Performance Characteristics*

TID is a screening process for selecting young athletes to determine what sports they are most likely successful in and then lead them to the most suitable sport for them (Woodman, 1985). Evolving through the approaches of TID during the last decades, many different systems were installed in different countries (Pion, 2016). It is clear

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that a scientific selection from the start is preferable to the natural selection at the early stage. Therefore, scientists and coaches should use comprehensive generic testing methods for different groups of sports (Krasilshchikov, 2011). Talent identification profiles are usually used to assess athletes, and selecting the assessment of the profiles is usually limited to the treatment of raw scores and in some cases of normalized scores (Z-scores or MQ-scores). The use of predictive models is increasingly used in sport sciences. Until a few years ago there were techniques used to compare data sets (ANOVA and MANOVA) and regression analysis techniques which were applied generally. The Non-linear methods are increasingly on the rise (MLP and KFM) and therefore their value for making selections cannot be underestimated as they are more accurate than the current widespread applied statistical techniques.

The selection of talented athletes is always crucial and difficult. A young athlete within the same age category might be different in physical performance influenced by other factors. However, in the same chronological age group, it is important to consider the status of growth patterns and variations due to other factors, such as gender and peak height velocity (PHV), especially during childhood and adolescence stage (Beunen & Malina, 2008; Gabbard, 2008). The process of growth and maturity are interrelated and both of these factors affect the physical performance of children and adolescents (Beunen & Malina, 2008). Therefore, instead of de-selecting the young athlete, orientation might be the best solution to prevent dropout among talented young athletes.

#### *Orientation Instead of de-selection*

Based on the anthropometric measurements and physical performance tests, young athletes can be oriented within a specific sport. Pion, Segers, Philippaerts, and Lenoir (2015), succeeded in orienting male students of the Flemish elite sport school in nine different sports by applying the use of 22 tests of anthropometry, physical fitness and motor coordination. This research has discovered another method in TID program, which is orientation. Instead of selection and de-selection of young athletes, they oriented them according to a specific sport based on their anthropometric measurements and physical performance tests that might give positive result in the future. The de-selection process of the young athlete in their early age will prove to be a source of negative motivation for them and they might possibly lose the best athlete in the future. Orientation seems the best way to make sure the young athlete will have a chance to develop their skill and performance in the future, while, de-selection might “kill” the passion of young talented athlete in sport. Future Olympic gold medalists might also be de-selected in the early stages or at an early age, those were the main consequences of the selection and de-selection programs.

#### *Aims*

National governments have invested substantial amounts of money in talent identification and promotion programs. Currently, the Malaysian government has allocated 34 Million Malaysian Ringgit for TID program and target of 100,00 children to be tested. This new program has been launched in 2015 and known as MyTID. This program is a continuation of the previous program with some modifications and improvements. Those who were selected will be sent to specific schools that have been determined by the government.

In Malaysia, there are a few types of schools that engage in this type of program but in this study, the researchers will concentrate on 3 types of schools that have the relationships with young athletes. The three schools are National Sport School (NSS), State Sport School (SSS) and Normal School (NS). NSS is for the young elite athletes, those who have been selected through the TID program. NSS is also for the young athletes, but not for the elite athletes and it is controlled by the State Education Department. Most of the students in SSS are the young athletes that do not perform well in the selection to NSS. Whilst, the Normal School is a daily school and the students are from various backgrounds.

The objective of the TID Program (Malaysia) is to test children aged seven to 12 years through a series of anthropometric measurements and physical performance tests which were more focused on a scientific approach. This study will identify the different characteristic among student in 3 types of schools (NSS, SSS, NS). The differences are based on anthropometric measurements and physical performance tests. Consequently, the central question is to ensure that the student has been placed in the correct school based on their physical performance tests and anthropometric measurements. The main purpose of this study is to discriminate and define characteristics among students in 3 types of schools.

## METHODS

### *Participants and Study Design*

A sample of 1083 students (male=625, Female 458) aged between 13 years to 16 years participated in this study. The students were from 3 different type of schools, namely National Sport School (n=300), State Sport School (n=333) and Normal School (n=450). There were 190 males and 110 females from National Sport School, 210 males and 123 females from State Sport School. Meanwhile, there were 225 males and 225 females from the Normal School. A student from National Sport School and State Sport School consists of young athletes. The students from Normal School is just ordinary students with various backgrounds. For all participants, written informed parental consent was obtained.

### *Measurement*

Tests and measurements conducted to gather data on student anthropometry and physical performances. Height and weight measurements were used to indicate student's anthropometric measurements. Furthermore, the student have been tested with six physical fitness tests to indicate their physical performances.

This particular research conducts physical performance tests consisting of standing broad jump to measure power, sit and reach test to measure flexibility, 30-meter sprint test to measure speed, 7 level sit-ups to measure abdominal strength, 10-meter shuttle run test to measure agility, and bleep test to measure cardiovascular fitness. Standing broad jump, sit and reach, sprint and shuttle run are made based on the procedure by AAHPERD (1976). Bleep test's procedure is based on procedure made by Cooper Institute (1999). In addition, the VO<sub>2</sub>max for bleep test used the method by Barnett et al. (1993). Subject height measured using portable stadiometer in centimeter units (cm). Subjects are required to stand with both heels close to each other. Both the subject's hands were positioned on their side with palms facing their thighs as recommended by Gordon et al. (1991) and Martin et al. (1991). The reading is taken close to 0.1 cm. Body Composition Analyzer Tanita, TBF-300 was used to measure Weight and BMI of the subject.

### *Data Analysis*

A discriminant analysis (DA) was applied to classify the students into their specific school systems. The validation of the predictive models was conducted using the leave-one-out method of cross-validation. Multivariate analysis (MANOVA) was applied to define the different of overall characteristic (physical performance) among students in 3 type of school. Meanwhile, Post-Hoc Bonferroni was used to identify which characteristic had a different relationship between students in the 3 types of schools. The DA (significance for was set at  $p < 0.05$ ) and Multivariate analysis were performed using IBM SPSS v 22.

## RESULTS

TABLE 1  
Mean (SD) from Descriptive Analysis for Students in Three Types of School.

|                     | National Sport School (n=300) |               | State Sport School (n=333) |               | Normal School (n=450) |               |
|---------------------|-------------------------------|---------------|----------------------------|---------------|-----------------------|---------------|
|                     | Male                          | Female        | Male                       | Female        | Male                  | Female        |
|                     | Mean (SD)                     | Mean (SD)     | Mean (SD)                  | Mean (SD)     | Mean (SD)             | Mean (SD)     |
| Age                 | 14.71 (1.14)                  | 14.62 (1.09)  | 14.59 (1.15)               | 14.70 (1.08)  | 14.53 (1.19)          | 14.54 (1.19)  |
| Height              | 167.82(7.02)                  | 160.82 (7.05) | 161.68(8.46)               | 159.21 (5.90) | 159.13 (9.91)         | 153.16 (6.09) |
| Weight              | 59.05(9.58)                   | 54.88(8.59)   | 51.59 (9.20)               | 51.10 (7.36)  | 52.38 (15.55)         | 48.03 (12.37) |
| Standing Broad Jump | 215.17(22.00)                 | 185.73(19.59) | 206.14(22.56)              | 164.67(21.06) | 175.16(29.58)         | 122.55(22.50) |
| 7 Level Push-up     | 5.95 (0.92)                   | 5.61(1.09)    | 5.80 (0.89)                | 4.98 (1.02)   | 4.44 (1.44)           | 3.71 (1.50)   |
| 10m Shuttle Run     | 10.34(0.47)                   | 11.20 (0.65)  | 10.51 (0.54)               | 12.10 (0.89)  | 11.62 (1.52)          | 13.63 (1.70)  |
| Sit and Reach       | 37.59 (6.20)                  | 37.09 (4.88)  | 35.03 (5.89)               | 33.97 (5.39)  | 28.06 (5.99)          | 27.16 (6.18)  |

|            |              |              |              |              |              |              |
|------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 30m Sprint | 4.55 (0.31)  | 5.02 (0.36)  | 4.53 (0.38)  | 5.41 (0.39)  | 5.06 (0.65)  | 6.08 (0.80)  |
| Vo2Max     | 52.16 (2.67) | 53.66 (3.33) | 48.00 (2.77) | 48.01 (2.35) | 46.03 (7.54) | 38.13 (5.68) |

Overall, the descriptive analysis shows that male students and female students from National Sport School (NSS) had better physical performances from the other two schools. They also have the greater measurement for their heights and weights, compared to State Sport School (SSS) and Normal School (NS). It is shown that students in NSS have a bigger physical size compared to the others school.

TABLE 2  
Discriminant Analysis between Three Types of School

|     | Male (77.8%) |         |        | Female (88.2%) |         |        |
|-----|--------------|---------|--------|----------------|---------|--------|
|     | NSS (%)      | SSS (%) | NS (%) | NSS (%)        | SSS (%) | NS (%) |
| NSS | 82.1         | 13.2    | 4.7    | 82.7           | 16.4    | 0.9    |
| SSS | 13.8         | 72.4    | 13.8   | 9.8            | 84.6    | 5.7    |
| NS  | 5.3          | 15.6    | 79.1   | 0              | 7.1     | 92.9   |

The analysis aimed at discriminating between 3 different schools showed that there was a 77.8% correct classification for male students. Meanwhile, 88.2% was a correct classification for female students. There were 12 false negatives for males and there were no females found as false negatives between NSS and NS. However, there were 9 false positives for male and 1 false positive for females between NSS and NS. Meanwhile, SSS showed 29 false negatives and 29 false positives in male students. For the females, there were 12 false negatives and 7 false positives for SSS.

TABLE 3  
MANOVA Analysis for Physical Performances for 3 Type of School

| Gender                      | Male (n=625)   | Female (n=458) |
|-----------------------------|----------------|----------------|
| <u>Physical Performance</u> |                |                |
| Height                      | 70.59**        | 52.32**        |
| Weight                      | 26.43**        | 13.12**        |
| Standing Broad Jump         | 172.06**       | 331.34**       |
| Seven Level Sit-Up          | 113.51**       | 82.12**        |
| 10m Shuttle Run             | 104.07**       | 140.62**       |
| Sit and Reach               | 145.44**       | 119.34**       |
| 30m Sprint                  | 89.90**        | 111.82**       |
| Vo2Max                      | 105.98**       | 695.26**       |
| <b>Multivariate F</b>       | <b>60.15**</b> | <b>78.19**</b> |

\*  $p < 0.05$  \*\*  $p < 0.01$

Multivariate analysis showed significant differences for males ( $p < 0.01$ ) and females ( $p < 0.01$ ) in overall physical performance for the 3 types of schools. Univariate showed significant differences between specific physical performances for male students and female students in NSS, SSS and NS.

*Post-Hoc Bonferroni*

Post-Hoc Bonferroni for mean difference between type of school and physical performance.

| Gender/<br>Physical performances | MALE   |        |                | FEMALE |        |                |
|----------------------------------|--------|--------|----------------|--------|--------|----------------|
|                                  | School | School | Mean Different | School | School | Mean Different |
| Height                           | NSS    | SSS    | 0.73**         | NSS    | NS     | 0.86**         |
|                                  | NSS    | NS     | 0.99**         | SSS    | NS     | 0.65**         |
|                                  | SSS    | NS     | 0.26**         |        |        |                |
| Weight                           | NSS    | SSS    | 0.66**         | NSS    | SSS    | 0.35*          |
|                                  | NSS    | NS     | 0.55**         | NSS    | NS     | 0.55**         |
| SBJ                              | NSS    | SSS    | 0.22**         | NSS    | SSS    | 0.54**         |
|                                  | NSS    | NS     | 0.99**         | NSS    | NS     | 1.59**         |
|                                  | SSS    | NS     | 0.77**         | SSS    | NS     | 1.05**         |
| Seven Level Sit-Up               | NSS    | NS     | 1.01**         | NSS    | SSS    | 0.44**         |
|                                  | SSS    | NS     | 0.90**         | NSS    | NS     | 1.25**         |
|                                  |        |        |                | SSS    | NS     | 0.81**         |
| 10m Shuttle Run                  | NSS    | NS     | 0.78**         | NSS    | SSS    | 0.56**         |
|                                  | SSS    | NS     | 0.68**         | NSS    | NS     | 1.47**         |
|                                  |        |        |                | SSS    | NS     | 0.92**         |
| Sit & Reach                      | NSS    | SSS    | 0.36**         | NSS    | SSS    | 0.45**         |
|                                  | NSS    | NS     | 1.31**         | NSS    | NS     | 1.36**         |
|                                  | SSS    | NS     | 0.95**         | SSS    | NS     | 0.91**         |
| 30m Sprint                       | NSS    | NS     | 0.63**         | NSS    | SSS    | 0.51**         |
|                                  | SSS    | NS     | 0.66**         | NSS    | NS     | 1.34**         |
|                                  |        |        |                | SSS    | NS     | 0.83**         |
| VO2Max                           | NSS    | SSS    | 0.71**         | NSS    | SSS    | 0.93**         |
|                                  | NSS    | NS     | 0.87**         | NSS    | NS     | 2.40**         |
|                                  | SSS    | NS     | 0.16*          | SSS    | NS     | 1.47**         |

\*  $p < 0.05$  \*\*  $p < 0.01$  , NSS= National Sport School, SSS=State Sport School, NS= Normal School

The Post-Hoc analysis showed significant difference for the male student in NSS, SSS and NS for height, sit and reach (flexibility), standing broad jump (power) and vo2max (cardiovascular endurance). There were no significant differences for male students between NSS and NS for weight. Moreover, there were no significant difference for male students between NSS and SSS for 7 level sit up (abdominal strength), shuttle run (agility) and 30 m sprint (speed).

Meanwhile, Post-Hoc showed significant difference for female students between NSS, SSS and NS for standing broad jump (power), 7 level sit up (abdominal strength), 10m shuttle run (agility), sit and reach (flexibility), 30m sprint (speed) and Vo2max (cardiovascular endurance). There were no significant differences for female students between NSS and SSS in height. Besides that, there were no significant differences between SSS and NS in weight for female students.

**DISCUSSION**

The main aim of this study was to examine and define performance characteristics for the male students and female students in 3 types of schools in Malaysia. The results of this study showed that the anthropometric measurement and physical performance tests could be used to discriminate between students in the different

types of schools (NSS, SSS, NS). Besides that, this study showed that there were different performances in the physical tests among students, which can help to discriminate students into the different schools.

The result in the descriptive analysis showed that students in NSS had better scores compared to the students in SSS and NS. A student in NSS had a fixed schedule for training and had better coaches compared to other schools. It is because the students in NSS were young elite athletes. For youngsters who were actively involved in sports, differences in the level of physical fitness can be explained by the amount of hours spent on practicing the sport (Opstoel, Pion, Elferink-Gemser, Hartman, Willemse, Philippaerts, Visscher & Lenoir, 2015). This has explained the students in NSS were much better in physical performances compared to SSS and NS.

The discriminant analysis overall showed that the students were placed in the right school. However, some students were not in the right school and the important part is that the student in NS that should be placed in the NSS. There were 12 male students from NS that have the characteristics to be in the NSS. They might be talented young athletes and may have the potential to win the Olympic Gold Medals for Malaysia.

The different characteristics among students had been proven using Multivariate analysis. Results showed significantly different characteristic among students in different schools. All of the physical performance tests that have been used in this research, were significantly different among students (male and female) in NSS, SSS and NS. The subjects of this research were from different backgrounds and locations, especially NSS with SSS and NS. Previous research showed that physical performances were related to training time and residential location (Dapia et al. 2009, Tinazci & Emiroglu, 2009).

In the current study, we can discriminate students with their type of school according to their physical performance. There were different physical performances among students in the 3 schools. For the males, we can discriminate NSS, SSS and NS using their height, power, flexibility and cardiovascular endurance. Besides that, for females, the students can be discriminated using power, abdominal strength, agility, flexibility, speed and cardiovascular endurance.

In conclusion, the results of this study showed that the different characteristics among students in the different schools in Malaysia could be defined through physical performances and anthropometric measurements. Nevertheless, there was some possibilities to detect talented young athletes and there is still room for improvement in the TID system in Malaysia. Motor coordination should be included as one of the main criteria in selection of young athletes. Selection or detection should not end up in certain age or level, it should be a continuous process but the most important aspect is to define what considered to be a good TID program.

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