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THE TOTAL SCORE OF ATHLETICISM PROFILES AMONG MALAYSIAN FOOTBALL PLAYERS: A BINARY LOGISTIC REGRESSION ANALYSIS

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ABSTRACT

Performance-based tests are commonly used by strength and conditioning coaches to assess athletes and the purpose can ranged from functional diagnostic to decision making in return-to-sport. Although these individual tests provide precise information on the strengths and weaknesses of each athlete, the large amount of such data can complicate communication between various stakeholders. Therefore, the present study aims to investigate the utility of a composite score called total score of athleticisms (TSA) in Malaysian football players and to examine the predictive ability of the TSA to identify group membership. A total of ninety-five male Malaysian football players participated in this study and their performance in vertical jump, 30-m sprint and yoyo intermittent recovery level 2 were measured. The result of each performance test was converted to a standard score and averaged to create the TSA of each athlete. The results from independent t-test indicated significant differences of moderate to large effect sizes (Cohen's *d* of 0.69 to 1.07) in age, height, body mass and TSA scores ($p \leq 0.001$) between senior and developmental players. Logistic regression analysis showed that TSA score was able to distinguish between senior and developmental players ($\chi 2$ (1, n = 95) = 23.763, $p <$ 0.001). The TSA score accounted for 29.5% of the variance in group membership and correctly classified 70.5% of the players. When TSA scores were divided into tertiles, the Cochran-Armitage analysis indicated a statistically significant trend in the number of senior players across tertiles (z = 19.432, $p < 0.001$) with the percentage of senior players being the highest (77.1%; 27/32) in the high TSA tertile followed by medium (40.6%; 13/32) and low (29.0%; 9/31) TSA tertiles. The ability of the TSA to differentiate between senior and developmental players could be attributed to power indicators being a significant predictor of successful performance among elite football players and hence, highlights its potential use by coaches to streamline collaborative communication and for team selection.

Keywords: *Fitness Performance, Composite Score, Standard Score, Profiling*

INTRODUCTION

Performance-based tests can be regarded as a fixed feature of athletic development as athletes routinely undergo different test batteries for various purposes ranging from functional diagnostic to injury prevention and return-to-sport assessments (Oleksy et al., 2022). From the perspective of strength and condition coaches, assessment of an athlete's physical capacity allow training programmes to be specifically designed, monitored and altered when needed but the collection of individual test results of many athletes over seasons or even years can lead to the build of a large amount of data (Turner et al., 2019). This is particularly pertinent in football as this highly demanding sport requires players to have an effective anaerobic component to execute repeated bouts of high intensity actions such as sprinting, jumping and tackling as well as a strong aerobic component to facilitate recovery between these intermittent high-intensity bouts and to maintain the endurance required for full matches (Wing et al., 2020). Multiple tests across a number of domains have been recommended for fitness assessment of football players which include, but not limited to, countermovement jump (CMJ), reactive strength, 1 repetition maximum squat, agility, linear speed and yo-yo intermittent recovery (YYIR) tests (Turner et al., 2011). Various combinations of these tests into a battery yield many individual test results that can complicate collaborative communication instead of augmenting decision-making between various stakeholders such as strength and conditioning, physiotherapist, psychologist, and technical coaches (Turner et al., 2019). Nevertheless, the assessment of these fundamental fitness characteristics remains integral as it helps strength and conditioning coaches to quantify the physiological and neuromuscular qualities that underpin footballing performance.

Contrary to the conventional method of analysing each test result based on predetermined threshold, Turner et al (2019) proposed the use of a composite score called Total Score of Athleticism (TSA) in which standardized scores of multiple performance characteristics were calculated and averaged for each player. In addition to simplifying the interpretation of a test battery results down to a single score, the composite score provides contextualized insights into each player's performance relatively to their teammates and guides setting of realistic goals in fitness level (Wing et al., 2020). The utility of this approach has been investigated in several studies such as in the study by Tibana et al. (2024) in which the TSA score derived from body fat percentage, aerobic capacity, muscle power and muscle endurance was shown to be strongly correlated with the CrossFit Open performance whereas in a separate study, TSA score of countermovement jump (CMJ) metrics across several microcycles was shown as a potential indicator of fatigue and performance changes during intense training and competitive periods in elite volleyball players (Rebelo et al., 2024). In the context of football, Wing et al. (2020) reported that TSA score (back squat, bench press, squat jump, CMJ, 20-meter sprint, arrowhead agility test) of elite youth football players was significantly correlated to heading success ($r = 0.61$) but not other footballing skills such as passing, tackling, shooting and dribbling. In another study that involved youth football players, Barraclough et al (2024) investigated the association between TSA score (from CMJ, 20-meter sprint, 505 agility test and 1 km run) and perceived potential ratings but the positive relationship observed did not reach statistical significance. The use of composite scores such as TSA as a return-to-sport readiness after anterior cruciate ligament (ACL) reconstruction in football players was also explored with findings indicating significant differences between players who underwent ACL reconstruction and uninjured players (Maestroni et al., 2023) or healthy controls (Oleksy et al., 2021). Hence, the TSA approach is shown to have many practical applications, but its utility is yet to be examined in Malaysian football players of differing competitive levels. Therefore, the present study aims to investigate

whether senior and developmental Malaysian football players differ in their TSA score and to examine the predictive ability of the TSA to identify group membership.

METHODOLOGY

Participants

A total of ninety-five male professional Malaysian football players provided informed consent and voluntarily participated in this study after the procedures, possible risks and benefits of the study were explained to them. Based on the classification used by McAuley et al. (2021), forty nine players were who competed at Malaysia Super League (n = 25) or Premier League (n = 24) were categorised as senior while forty six players who competed at development leagues, which included President Cup (n = 21) and Youth Cup (n = 25), were classified as developmental. Given the sampling procedure for such research (Maestroni et al., 2023), post hoc power analysis using G*Power (version 3.1.9.7) revealed that the statistical power for between group comparison was 97% for detecting a large, 67% for a moderate and 16% for a small effect size. The study protocol was approved by the Research Ethics Committee at Universiti Teknologi MARA (Approval code: REC/07/2022 (ST/MR/151).

Measurements

Standing height and body composition of the participants were recorded using a stadiometer BSM-170 (InBody Co. Ltd., South Korea) and via body impedance analysis (InBody 270, InBody Co. Ltd., South Korea), respectively. The participants completed the FIFA 11+ warm-up programme before vertical jump, 30-m sprint and Yoyo intermittent recovery level 2 performance of the footballers were collected as part of their routine fitness assessment. The Yardstick vertical jump device (Swift Performance Equipment, Australia; intraclass correlation coefficient (ICC) = 0.98) (Gabbett et al., 2008) was used to measure the vertical jump height of the participants (Saidi et al., 2024). After adjusting the Yardstick to each of the participant's standing reach height, the participants were instructed to perform a countermovement jump by performing a rapid downward movement to a self-selected depth followed by a maximal intensity vertical jump. The horizontal vanes of the Yardstick vertical jump device were displaced by the participants using fingers of their dominant arm at the peak of the jump. The highest jump height based on the number of vanes that were displaced from two trials was used for analysis. The sprint ability of the participants was measured with a 30-meter sprint test (Saidi et al., 2022). All the participants performed two maximal sprint trials over a 30-meter distance from a standing start with the sprint time captured using infrared timing gates (Speed Trap II, Brower Timing System, USA; ICC = 0.99) (Shalfawi et al., 2012) and the fastest sprint time was used for analysis. Recovery periods were a minimum of one minute following each trial for the vertical jump and 30-m sprint tests. The yoyo intermittent recovery level 2 (YYIR2) is a repeated 2 × 20 m interval of shuttle runs interspersed by 10 seconds of active rest period (Bangsbo et al., 2008). The speed of the test increased progressively as dictated by an audio bleep emitted from an audio speaker and participants were instructed to complete as many shuttles as possible. Failure to complete the course in the allocated time for the first time resulted in a warning and on the second time, resulted in termination of the test. The distance covered in the last complete successful shuttle was used for subsequent analysis.

Data analysis

Descriptive statistics such as mean and standard deviation were calculated for all the variables. Sample normality and homogeneity of variances were assessed with the Shapiro-Wilk test and Levene's test, respectively. The TSA is a composite score of fitness performance for each player that was derived by averaging standardized scores from vertical jump height, 30-m sprint time and distance covered in YYIR2. The vertical jump height, 30-m sprint time and distance covered in YYIR2 were converted to z-scores with the following formula: *z*-score = (player score – cohort mean)/cohort standard deviation. As negative *z*-score values of 30-m sprint time were indicative of superior performance, these *z*-scores were multiplied by –1 to transform negative values into positive values in order to align the polarity across the three tests that contribute to the TSA (Barraclough et al., 2024). An independent *t*-test was used to examine differences in the demographic characteristics and TSA scores between senior and developmental players with Cohen's *d* effect sizes classified as small (d = 0.2), moderate (d = 0.5) or large (d= 0.8). Binary logistic regression was used to examine the predictive ability of TSA in identifying group membership (senior or developmental). Unstandardized coefficients (β), adjusted r^2 value and odds ratio calculated via logistic regression with 95% confidence intervals were reported. The TSA scores were divided into tertiles (tertile 1 = high; tertile 2 = medium; and tertile 3 = low) and Cochrane-Armitage test was used to assess trend in the proportion of senior and developmental players across the tertiles. The significance level for all statistical tests was set at $p < 0.05$. All statistical analyses were performed with SPSS 29 (SPSS, IBM, USA).

RESULT AND DISCUSSION

The demographic characteristics and TSA scores of senior and developmental players are presented in Table 1. The results from independent t-test indicated significant differences of moderate to large effect sizes in age, height, body mass and TSA scores ($p \leq 0.001$). Specifically, senior players were older (d = 1.07; $p < 0.001$), taller (d = 0.80; $p < 0.001$) and heavier (d = 0.68; p = 0.001) than developmental players. Although the significantly older senior players may indicate a longer training history and greater exposure to competitions in comparison to the younger developmental players, the senior players also appeared to have anthropometric and body composition advantages over developmental players. Not only were the senior players taller and heavier, they had significantly greater skeletal muscle mass (d = 0.89; $p < 0.001$) and lower body fat percentage (d = 0.69; $p < 0.001$). Having a low body fat percentage and high skeletal muscle mass is desirable for a player as a high body fat percentage negatively impacts power-to-weight ratio, aerobic fitness, thermoregulation, acceleration capacity, and energy expenditure whereas skeletal muscle mass contributes to strength and power performance that are particularly crucial during critical moments in matches such as offensive/defensive duels and goal scoring (Martinez-Ferran et al., 2022). In concordance to football being an an intermittent team sport of high intensity, players are frequently subjected to multiple performance-based tests to ensure that players are competent and possess physical capabilities that meet the performance requirements of a football game. Undeniably, the result of these individual tests will precisely highlight each player's strengths and weaknesses for strength and conditioning coaches to develop training programs and monitor the progress of the athletes. However, when the scores of these multiple tests are standardize and averaged to generate a composite score (such as TSA) for each player, the results of a test battery is consolidated to provide an overall performance indicator and the rank of an individual player in relation to the team. Although each playing position is known to have a unique physiological demand that are

addressed by strength and conditioning coaches via specific training programs (Dolci et al., 2020), it does not negate the fact that a player has to be well rounded in various fitness domains as footballing performance is simultaneously driven by different physical competencies (Turner et al., 2019). This forms the basis for the present explorative study in which the utility of TSA score derived from vertical jump height, 30-m sprint time and distance covered in YYIR2 in Malaysia football players and its predictive ability in identifying group membership was investigated.

Table 1: Comparison of Demographic Characteristics and TSA Scores between Senior and Developmental Players

	Senior (n = 49)	**Developmental (n = 46)**	**Cohen's *d* (95% CI)**	***p* value**
Age (year)	21.9 ± 3.2	19.3 ± 1.1	1.07 (0.64 – 1.50)	< 0.001
Height (cm)	174.6 ± 7.4	169.2 ± 6.1	0.80 (0.38 – 1.22)	< 0.001
Weight (kg)	69.5 ± 8.0	64.3 ± 7.2	0.68 (0.26 – 1.09)	0.001
Body fat (%)	13.9 ± 3.3	16.2 ± 3.3	0.69 (0.28 – 1.11)	0.001
Skeletal muscle mass (kg)	34.0 ± 4.2	30.5 ± 3.6	0.89 (0.46 – 1.31)	< 0.001
TSA score	0.32 ± 0.69	-0.35 ± 0.57	1.06 (0.63 – 1.49)	< 0.001

Findings from the present study showed that the TSA score was significantly higher in the senior group as compared to the developmental group (d = 1.06; p < 0.001). Logistic regression analysis showed that the model was statistically significant, χ^2 (1, n = 95) = 23.763, p < 0.001, indicating that TSA score was able to distinguish between senior and developmental players. The TSA score accounted for 29.5% (Nagelkerke r^2) of the variance in group membership and correctly classified 70.5% of the players. For every additional increase of 1 unit in the TSA score (β = 1.692), the odds of belonging to the senior group increased by 84% (OR = 5.428; 95% CI: 2.441-12.071). When TSA scores were divided into tertiles (tertile 1 = high; tertile 2 = medium; and tertile 3 = low), the Cochran-Armitage analysis indicated a statistically significant trend in the number of senior players across tertiles (z = 19.432, p < 0.001) with the percentage of senior players being the highest (77.1%; 27/32) in the high TSA tertile followed by medium (40.6%; 13/32) and low (29.0%; 9/31) TSA tertiles (Figure 1). The ability of the present TSA, which incorporated two power-based tests and one cardiorespiratory fitness test, in differentiating between senior and developmental players could be attributed to power indicators being a significant predictor of successful performance among elite football players (França et al., 2022; Wing et al., 2020). The greater skeletal muscle mass and lower body fat percentages may have contributed to the better and power performance of the senior players and reflects the game demands of playing at a higher level as compared to developmental players. Pragmatically, players with TSA scores below zero represent opportunity for identified areas to be targeted in the training program intervention. Considering the cohort of football players investigated in the present study, it should be noted as well that the training history, style of play, and resources including financial, infrastructure and expertise dedicated to senior players may differ from those of the developmental players. However, the current results highlight that the TSA may have potential utility for within club comparisons such as for team selection purposes. When TSA scores are generated exclusively within a squad, it can be used to set realistic training goals instead of using comparative data from external sources as a basis without the necessary financial and logistic support (Turner et al., 2019).

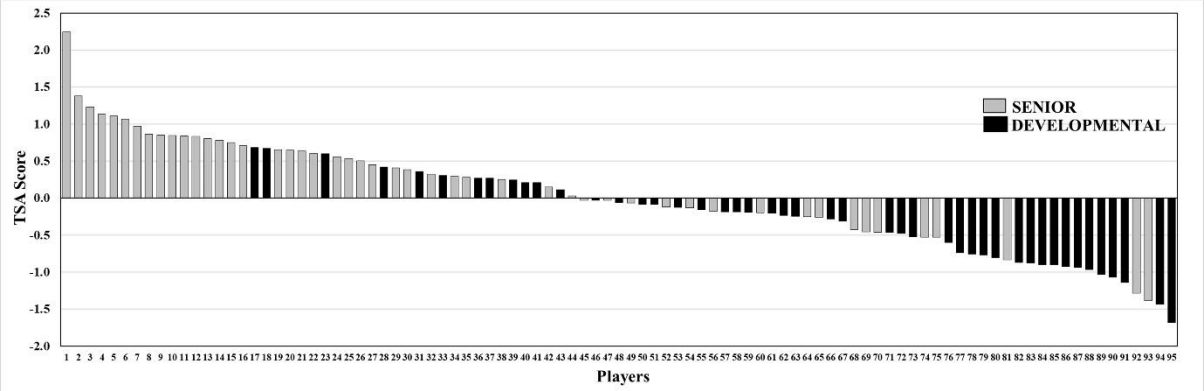

Figure 1: Total Score of Athleticism (TSA) Values of Senior and Developmental Players. T, tertile.

CONCLUSION

The present study explored the utility of TSA in Malaysian football players and found that the composite score derived from vertical jump, 30-m sprint and YYIR2 was able to differentiate between senior and developmental players. The use of TSA can make communication of fitness test results between various stakeholders simpler and more efficient. TSA also has the potential to be a valuable tool that can be used by coaches to screen fitness performance of the players in relation to team members, set achievable fitness goals and facilitate decision making such as team selection.

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CONFLICT OF INTEREST

The authors have no relevant financial or non-financial interests to disclose.

AUTHORS CONTRIBUTIONS

GYA and RMFRA conceptualized the study. GYA, RMFRA, CYY and AN contributed to the study design. MFHR, RMFR, FAR, SA, CYY and GYA were involved in the data collection and data analysis. MFHRA and GYA wrote the manuscript while all authors participated in the final approval of the manuscript..

REFERENCES

Bangsbo, J., Iaia, F. M., & Krustrup, P. (2008). The Yo-Yo intermittent recovery test: a useful tool for evaluation of physical performance in intermittent sports. *Sports Medicine*, *38*, 37-51.

Barraclough, S., Till, K., Kerr, A., & Emmonds, S. (2024). Exploring the relationships between potential, performance, and athleticism in elite youth soccer players. *International Journal of Sports Science & Coaching*, *19*(6), 2424-2437. https://doi.org/10.1177/17479541241270192

Dolci, F., Hart, N. H., Kilding, A. E., Chivers, P., Piggott, B., & Spiteri, T. (2020). Physical and Energetic Demand of Soccer: A Brief Review. *Strength & Conditioning Journal*, *42*(3), 70-77. https://doi.org/10.1519/ssc.0000000000000533

França, C., Ihle, A., Marques, A., Sarmento, H., Martins, F., Henriques, R., & Gouveia, É. R. (2022). Physical Development Differences between Professional Soccer Players from Different Competitive Levels. *Applied Sciences*, *12*(14), 7343. https://www.mdpi.com/2076-3417/12/14/7343

Gabbett, T. J., Sheppard, J.M., Pritchard-Peschek, K.R., Leveritt, M.D., Aldred, M.J. (2008). Influence of closed skill and open skill warm-ups on the performance of speed, change of direction speed, vertical jump, and reactive agility in team sport athletes. *Journal of Strength and Conditioning Research*, *22*(5):1413-5. doi: 10.1519/JSC.0b013e3181739ecd.

Maestroni, L., Turner, A., Papadopoulos, K., Sideris, V., & Read, P. (2023). Total Score of Athleticism: Profiling Strength and Power Characteristics in Professional Soccer Players After Anterior Cruciate Ligament Reconstruction to Assess Readiness to Return to Sport. *Am J Sports Med*, *51*(12), 3121-3130. https://doi.org/10.1177/03635465231194778

Martinez-Ferran, M., Rafei, E., Romero-Morales, C., Pérez-Ruiz, M., Lam-Meléndez, A., Munguia-Izquierdo, D., & Pareja-Galeano, H. (2022). Optimizing Field Body Fat Percentage Assessment in Professional Soccer Players. *Applied Sciences*, *12*(2), 727. https://www.mdpi.com/2076-3417/12/2/727

McAuley, A. B., Hughes, D. C., Tsaprouni, L. G., Varley, I., Suraci, B., Roos, T. R., Herbert, A. J., & Kelly, A. L. (2021). The association of the ACTN3 R577X and ACE I/D polymorphisms with athlete status in football: A systematic review and meta-analysis. *Journal of Sports Sciences*, *39*(2), 200-211.

Oleksy, L., Krolikowska, A., Mika, A., Kuchciak, M., Szymczyk, D., Rzepko, M., Bril, G., Prill, R., Stolarczyk, A., & Reichert, P. (2022). A Compound Hop Index for Assessing Soccer Players' Performance. *J Clin Med*, *11*(1). https://doi.org/10.3390/jcm11010255

Oleksy, Ł., Mika, A., Królikowska, A., Kuchciak, M., Stolarczyk, M., Kielnar, R., Racheniuk, H., Szczegielniak, J., Łuszczki, E., & Stolarczyk, A. (2021). Composite Score of Readiness (CSR) as Holistic Profiling of Functional Deficits in Footballers Following ACL Reconstruction. *J Clin Med*, *10*(16). https://doi.org/10.3390/jcm10163570

Rebelo, A., Loturco, I., Pereira, J. R., Martinho, D. V., Valente-dos-Santos, J., & Broek, G. V. (2024). Impact of Congested Match Schedules on Countermovement Jump Metrics in Elite Volleyball Players. *The Journal of Strength & Conditioning Research*, 10.1519/JSC.0000000000005031. https://doi.org/10.1519/jsc.0000000000005031

Shalfawi, S.A.I., Enoksen, E., Tønnessen, E., Ingebrigtsen, J. (2012) Assessing test-retest reliability of the portable brower speed trap II testing system. *Kinesiology 44*(1), 24-30.

Saidi, N. F., Hian, T. C., Azidin, R. M. F. R., Aiman, S., Yu, C. Y., & Yong, A. G. (2024). Association and Predictive Ability of ACTN3 C/T, ACE I/D and PPARGC1A A/G Polymorphisms on Jump Height of Elite Malaysian Footballers. *Malaysian Journal of Sport Science and Recreation*, *20*(2), 1-8.

Saidi, N. F., Tan, C. H., Azidin, R. M. F. R., Ismail, H., Yu, C. Y., & Ang, G. Y. (2022). Associations between Speed, Power and Endurance Performance in Super League Soccer Players. *Malaysian Journal of Sport Science and Recreation (MJSSR)*, *18*(2), 150-160.

Tibana, R. A., Dominski, F. H., Andrade, A., De Sousa, N. M. F., Voltarelli, F. A., & Neto, I. V. S. (2024). Exploring the relationship between Total Athleticism score and CrossFit® Open Performance in amateur athletes: single measure involving body fat percentage, aerobic capacity, muscle power and local muscle endurance. *Eur J Transl Myol*, *34*(3). https://doi.org/10.4081/ejtm.2024.12309

Turner, A., Walker, S., Stembridge, M., Coneyworth, P., Reed, G., Birdsey, L., Barter, P., & Moody, J. (2011). A testing battery for the assessment of fitness in soccer players. *Strength & Conditioning Journal*, *33*(5), 29-39.

Turner, A. N., Jones, B., Stewart, P., Bishop, C., Parmar, N., Chavda, S., & Read, P. (2019). Total Score of Athleticism: Holistic Athlete Profiling to Enhance Decision-Making. *Strength & Conditioning Journal*, *41*(6), 91-101. https://doi.org/10.1519/ssc.0000000000000506

Wing, C. E., Turner, A. N., & Bishop, C. J. (2020). Importance of Strength and Power on Key Performance Indicators in Elite Youth Soccer. *J Strength Cond Res*, *34*(7), 2006-2014. https://doi.org/10.1519/JSC.0000000000002446

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