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RESEARCH ARTICLE

Anthropometric and physical fitness characteristics of male university cricket club players in accordance to player position and height categories [version 1; peer review: 1 approved with reservations, 1 not approved]

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Abstract

Background: The scientific research into the varied factors that influence cricket performance has become a focal area for overall improved performance. Although there has been documented evidence for both anthropometry and physical fitness among elite cricketers, there is a paucity of evidence among the club cricket cohort. This pilot study aims to evaluate the anthropometric and fitness measurements among a pilot sample of university club cricketers (n = 17; 9 batsmen and 8 bowlers) in South Africa.

Methods: Retrospective data were collected from the university's male first cricket team of the 2019/2020 season. The data included both anthropometric (height, body mass, and body mass index) and physical fitness (explosive power, strength, Yo-Yo, speed and agility) parameters. The results exhibited for every parameter were presented according to height categories and player positions (batsman and bowler). Student t-tests were performed to determine the differences between fitness and anthropometric variables among both height categories and player positions. All data were analysed using SPSS (Version 26, IBM). The level of significance was set at $p < 0.05$.

Results: The results indicated significant differences for height categories with regards to stature ($p = 0.000$) and agility ($p = 0.03$). Significant differences were also evident for different player positions with regards to body fat percentage ($p = 0.02$) and vertical jump distance ($p = 0.03$).

Conclusions: The findings of this pilot study indicated that cricketers who are shorter in stature are less superior with regards to anthropometric and fitness capabilities than their taller counterparts. In addition to being aware of the variances that exist for anthropometry, stature and fitness among cricketers at any level; this study provides implications for both coaches and sports scientists at

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Approval Status

	1	2
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2. Leonidas Petridis , University of Physical Education, Budapest, Hungary		
Any reports and responses or comments on the article can be found at the end of the article.		

the club level (under-researched level) in terms of how this can translate to player performances in accordance to height categories and player positions.

Keywords

Anthropometry, physical fitness, height categories, player positions, cricket

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Introduction

Cricket performance is influenced by many underlying factors which can further determine the success of cricketers in various distinct levels of experience and game formats (Noorbhai, 2015). The role played by batsmen and bowlers is evident in all game formats which can place various demands on athletes (Scanlan *et al.*, 2016). Stretch *et al.* (2000) discusses some of the crucial demands in cricket, which include physiological, perception and action (motor skills), biomechanics and psychological factors. For the purpose of this research, focus will be placed on the physiological aspect, which includes anthropometric and fitness profiles, and its impact on performance. In a study by Nazeer *et al.* (2018), it was concluded that stronger anthropometric and physical fitness characteristics elicit optimal performance at various competition levels.

Anthropometry

Koley (2011) defines anthropometry as the study of measurement of physical properties of the human body in terms of dimensions such as size and shape. Anthropometric profiles of athletes enable the establishment of whether an athlete will perform better in a certain sport and how they can meet the demands of the tasks involved (Stuelcken, Pyne and Sinclair, 2007; Koley, 2011).

In studies conducted by Stretch *et al.* (2000) and Koley (2011), they used the same methods to acquire anthropometric profiles of elite and university batsmen and found that batsmen tend to be shorter, with lesser body mass and with a greater body fat percentage than other cricketers. In addition, having a smaller size might be a selective advantage, especially for batting (Noakes, 2000). Having excess body mass could have a negative impact on the performance of cricketers, as it reduces the ground reaction forces for batsmen when making runs and for bowlers, at the point of delivery (Tanner and Gore, 2012).

Even though there are limited research findings on anthropometry for batsmen (Noorbhai, 2017), Johnstone and Ford (2010) looked at the overall physiological profiles of professional cricketers. Various anthropometric tools were used for physical assessment tests and some of these assessments used were commonly performed resulting in valid and reliable data. Stuelcken *et al.* (2007) adds that the gathering of information on anthropometric profiles helps in determining the potential for athletes to be successful.

Physical fitness

Another crucial aspect of cricket performance is physical fitness, which includes components such as physical strength, speed, aerobic capacity, and agility. Physical fitness is considered a measure of the body's ability to function efficiently and effectively in work and leisure activities (Javali and Koppad, 2017). According to Nazeer *et al.* (2018), running and the swinging of the bat are the movements that make up the batting skill. Hence, the development of physical fitness characteristics is paramount to meet the physical demands of cricket batting performance.

The vertical jump test, which is an indicator of lower body strength and explosive power, is a key physiological component of cricket skills for various cricket positions (Tanner and Gore, 2012). Furthermore, it is important to note that there are field based methods to measure lower body strength and power, which is the static vertical jump and the counter movement vertical jump. Another component is upper body strength, which was found to be positively correlated with superior batting performance, using the one-repetition maximum of a bench press (Taliep *et al.*, 2010). Furthermore, it was acknowledged that upper strength alone cannot be used as a predictor of overall batting performance.

The fitness component of speed in relation to cricket performance has not been well documented. In an article by Dana *et al.* (2014), speed was explored in terms of comparison between batsmen and bowlers, to determine who is the fastest using the 40m sprint test. It was discovered that batsmen are faster than bowlers and speed is directly proportional to power. As a result, muscular power is the force resulting from the sum of movements involving both strength and velocity factors (Wang *et al.*, 2017). Both muscular strength and power are crucial physical fitness components for explosive, short duration movements in sports.

Lastly, agility is a physical component commonly used by cricket batsmen for optimal performance. It is defined as the ability to efficiently change the body's direction, decelerate, and explosively accelerate again while maintaining body control and using a combination of coordinating skills (Srivastava *et al.*, 2017). According to Dana *et al.* (2014), batsmen were found to have faster running times as well as turning times than bowlers, which translates into agility.

The majority of anthropometric characteristics and physical fitness components have shown a strong relationship with body composition and performance test variables as experimented by Koley *et al.* (2011). However, further research is required that needs to be conducted in terms of measuring the anthropometric profiles of cricketers. Scientific research

into the varied factors that influence cricket performance has become a focal area for overall improved performance. Although there has been documented evidence for both anthropometry and physical fitness among elite cricketers, there is a paucity of evidence among the club cricket cohort and in particular, the university cricket club cohort. This is imperative for investigation, as most cricketers in such a cohort have finished their growth spurt after being involved in adolescent cricket (Noorbhai and Noakes, 2016). This research study aims to address this gap and provide insight into the physiological attributes of university club cricketers and how this influences their success in accordance to their player position and height categories.

Methods

Study design

This pilot study employed a cross-sectional research design in which analytical methods were employed. Anthropometric and physical fitness characteristics of male university cricket players were assessed at a specific point in time. The participants were male cricket players ($n = 17$) and were classified as bowlers and batsmen for comparative purposes.

Data collection

Retrospective data was collected and recorded from University of Johannesburg's first cricket team ($n = 17$) for the 2019/2020 season in which consent was obtained with the understanding that their data will be kept confidential and anonymised. The data included both fitness (explosive power, strength, aerobic capacity, speed, and agility) and anthropometric (body mass index (BMI) and skinfolds) parameters (Noorbhai, 2021). All anthropometric and fitness measurements were conducted in accordance to the guidelines and procedures by Miller (2012), and Howley and Faigenbaum (2016), respectively.

Due to the limited studies conducted on the role of anthropometric and physical fitness capabilities in performance among the club cricket cohort, this study will focus on parameters specific to cricket such as height, body mass, body fat percentage, explosive body power in the lower and upper body extremities, speed, aerobic capacity and agility. These will also be in relation to player height categories (short or tall) and player positions (batsman or bowler).

Data analysis

Parametric statistical tests were used to analyse data, whereby the population from which the sample was drawn was normally distributed on the variables of interest. Samples drawn from the population had the same variance (i.e. batsmen) and the observations were independent. Student t-tests were performed to determine the differences between fitness and anthropometric variables among both height categories and player positions. All data was analysed using SPSS (Version 26, IBM). The level of significance was set at $p < 0.05$.

Ethical considerations

Ethical approval for the study was granted by the Faculty of Health Sciences Research Ethics Committee at the University of Johannesburg (REC: 503-2020). Secondary data permission was also sought from the Research Ethics Committee. This research study also conforms to the World Medical Association Declaration of Helsinki on Ethical Principles for Research Involving Human Subjects.

Results

Descriptive results including stature, body mass and body fat percentage for the total group sample are shown below for both the two height categories (Table 1) and player position (Table 2). The two height categories were short (below 1.7m in height) and tall (above 1.7 m in height).

There were no significant differences for body mass and body fat percentage between the two height categories (short and tall) (Table 1). There was no significant difference for stature and body mass between batsmen and bowlers. However, there was a significant difference for body fat percentage between batsmen and bowlers ($p = 0.02$) (Table 2).

Table 1. Anthropometric data according to height categories.

Anthropometric variables	Total group participants ($n = 17$)	Short ($n = 7$)	Tall ($n = 10$)	p
Stature (m)	1.79 ± 0.09	1.71 ± 0.05	1.84 ± 0.06	0.000
Body mass (kg)	76.78 ± 18.5	82.85 ± 25.45	72.5 ± 11.36	0.27
Body fat (%)	10.14 ± 3.60	10.54 ± 3.63	9.87 ± 3.74	0.72

Presented as mean $\pm$ SD; m = metres; kg = kilograms; % = percentage; n = sample; * = $p < 0.05$.

Table 2. Anthropometric data according to player position.

Anthropometric variables	Total group participants (n = 17)	Batsmen (n = 9)	Bowlers (n = 8)	p
Stature (m)	1.79 ± 0.9	1.78 ± 0.10	1.79 ± 0.06	0.79
Body mass (kg)	76.78 ± 18.52	80.32 ± 23.71	72.79 ± 10.35	0.42
Body fat (%)	10.15 ± 3.60	12.02 ± 3.92	8.04 ± 1.58	0.02*

Presented as mean ± SD; m = metres; kg = kilograms; % = percentage; n = sample; * = p < 0.05.

Table 3 outlines the fitness parameters which includes explosive leg power, explosive upper body power, speed, aerobic capacity and agility for the total group sample by the two height categories.

There are no significant differences for explosive power (lower and upper body), speed and aerobic capacity between the height categories (short and tall). However, there is a significant difference for agility (both right and left) between the height categories (short and tall) (p = 0.03) (**Table 3**).

Table 4 outlines the fitness parameters of explosive leg power, explosive upper body power, speed, aerobic capacity and agility for the total group sample according to player positions.

Table 3. Fitness variables of the total group sample according to height categories.

Fitness variables	Total group participants (n = 17)	Short (n = 7)	Tall (n = 10)	p
Explosive power (lower body) Vertical jump distance (cm)	48.07 ± 6.24	47.40 ± 6.77	48.54 ± 6.17	0.72
Explosive power (upper body) Overhead medicine ball throw (cm)	13.08 ± 1.87	13.34 ± 1.92	12.89 ± 1.92	0.64
Speed 10 m (seconds) 40 m (seconds)	1.52 ± 0.10 5.15 ± 0.26	1.55 ± 0.08 5.18 ± 0.24	1.49 ± 0.10 5.13 ± 0.29	0.21 0.76
Aerobic capacity Yo-Yo intermittent recovery test (level reached)	16.72 ± 3.29	18.23 ± 3.39	15.67 ± 2.92	1.12
Illinois Agility Right (seconds) Left (seconds)	12.51 ± 2.00 11.86 ± 1.74	13.70 ± 2.42 12.94 ± 2.07	11.67 ± 1.13 11.11 ± 1.00	0.03* 0.03*

Presented as mean ± SD; cm = centimetres; n = sample number; * p < 0.05.

Table 4. Fitness variables of the total group sample according to player position.

Fitness variables	Total group participants (n = 17)	Batsman (n = 9)	Bowler (n = 8)	p
Explosive power (lower body) Vertical jump distance (cm)	48.07 ± 6.24	44.99 ± 6.31	51.53 ± 4.19	0.03*
Explosive power (upper body) Overhead medicine ball throw (cm)	13.08 ± 1.87	12.81 ± 2.01	13.38 ± 1.80	0.55
Speed 10 m (seconds) 40 m (seconds)	1.52 ± 0.10 5.15 ± 0.26	1.53 ± 0.10 5.25 ± 0.31	1.50 ± 0.10 5.04 ± 0.15	0.44 0.11
Aerobic capacity Yo-Yo intermittent recovery test (level reached)	16.72 ± 3.29	16.99 ± 3.54	16.43 ± 3.19	0.74
Illinois Agility Right (seconds) Left (seconds)	12.51 ± 2.00 11.86 ± 1.74	13.16 ± 2.44 12.14 ± 2.24	11.77 ± 1.09 11.55 ± 0.99	0.16 0.50

Presented as mean ± SD; cm = centimetres; n = sample number; * p < 0.05.

There are no significant differences for explosive power (upper body), speed, aerobic capacity and agility between batsmen and bowlers. However, there is a significant difference for explosive power (lower body) between batsmen and bowlers ($p = 0.03$) (Table 4).

This section presented the results in terms of mean scores with their corresponding standard deviations for the anthropometric and fitness parameters of height categories and different playing positions. The results indicated significant differences for the height categories with regards to stature and agility. The tall group showed a significantly higher stature than the short group. For agility time scores, the tall group showed faster times for both sides (right and left) than the short group.

Two significant differences were also evident for the different cricket positions with regards to body fat percentage and vertical jump distance. The batsmen showed the highest body fat percentage compared to bowlers. In terms of vertical jump distance, bowlers showed the highest mean score than batsmen.

Discussion

Anthropometric characteristics and physical fitness components have been shown to have a considerable influence on the potential success of cricketers (Koley *et al.*, 2017; Srivastava *et al.* 2017; Wang *et al.* 2017; Talib *et al.*, 2010). This pilot study aimed to evaluate the anthropometric and fitness variables among cricketers and to determine whether cricketers who are shorter in stature perform better than their taller counterparts. The different cricket positions were also evaluated in terms of anthropometric and fitness measurements among university club level cricketers.

This study found anthropometric and physical fitness differences between short and tall cricketers. However, significant differences were only found in stature and agility between the short and tall group. Similarly, the findings documented by Koley (2011) which evaluated anthropometric profiles of Indian inter-university male cricketers, found that the tall group had a higher mean score for stature than the total group mean, while the short group had a lower mean score for stature than the total group mean. This is also in accordance with Noakes and Durandt (2000), who found that most batsmen were shorter than the other cricket positions. However, it is crucial to note the paucity in research on fitness parameters with regards to height categories. As a result, reference was made to normative data for physically active adults by Tanner and Gore (2012).

With reference to normative data, both the short and tall groups fell below the norms for vertical jump distance, whereas the tall group performed better. In terms of speed, both short and tall cricketers performed significantly better compared to the normative data, with the tall group obtaining faster times. The short and tall groups were slightly below the norms for the Yo-Yo Intermittent Recovery Test, with the short group being slightly better than the tall group. With regards to agility, both the short and tall groups obtained excellent ratings, whilst the tall group obtained faster times than their counterparts.

The current study found interesting results across the cricket positions (batsmen and bowlers) for anthropometric and fitness tests. According to Johnstone and Ford (2010), bowlers are heavier and taller than batsmen, which contradicts the current findings in which bowlers were taller but lighter than batsmen. Body fat percentage and vertical jump distance between the batsmen and bowlers also showed a significant difference. Batsmen were found to have a higher body fat percentage than bowlers, which corresponds with the research conducted by Stretch *et al.* (2000) and Koley *et al.* (2011). This current study supports the findings by Dana *et al.* (2014) which found that bowlers are significantly taller than batsmen. With regards to stature and body composition (body mass), a significant difference among batsmen and bowlers regarding body fat percentage was evident. Hence, these findings partly support findings by Koley (2011), who found no significant difference for bowlers and batsmen in height and body composition. Johnstone and Ford (2010) found insignificant differences between batsmen and bowlers with regards to the vertical jump test, which contrast with the findings of this study, as the results highlighted a significant difference.

According to Noakes and Durandt (2000), batsmen were found to have faster running times and turning times than bowlers in relation to agility which is in contrast with the current findings. In terms of speed, current finding suggests that running speeds for batsmen and bowlers are alike, however the bowlers performed better in the sprint tests. This is similar to findings by Johnstone and Ford (2010) but in contrast to Dana *et al.* (2014), who discovered that batsmen were faster than bowlers. Current findings suggest that batsmen have superior aerobic fitness and these results have been linked with improved recovery and maintenance of optimal performance. With regards to upper body strength, the current findings indicate that bowlers performed better than batsmen (supported by MacDonald (2013)). However, the relevance of such results to match performance is unclear.

Strengths and limitations

This was a pilot study due to a smaller sample size and the inclusion of only male data. The data was also limited to only two cricket playing positions and can't be generalisable. Another limitation was the absence of the 505 Agility Test (which has been identified as a more specific test for change of direction specific to running between the wickets) and somatotype of the players. In this study, only the Illinois test was available. However, the depth of tests conducted has provided adequate insights into the anthropometric and physical fitness characteristics of male university cricket club players in accordance to height categories and player position.

Conclusion

Anthropometry and physical fitness are key to ensuring success in cricket performance. This study demonstrates that cricketers who are shorter in stature are less superior with regards to anthropometric and fitness capabilities than their taller counterparts, which makes the latter group more likely to be successful in cricket. The batsmen showed the highest body fat percentage compared to bowlers. In terms of the vertical jump distance, bowlers showed a higher mean score than batsmen. This study will assist coaches in terms of team selection by providing information that is essential for determining the potential for athletes to enhance performance. Future studies should include a larger sample size and also consider female data, along with the inclusion of the various cricket playing positions and height categories. In addition to being aware of the variances that exist for anthropometry, stature and fitness among cricketers at any level, this study provides implications for both coaches and sports scientists at the club level in terms of how this can translate to player performances in accordance to height categories and player positions.

Data availability

FigShare: Anthropometric and physical fitness variables. <https://doi.org/10.6084/m9.figshare.15086652.v1> (Noorbhai, 2021).

This project contains the following underlying data:

- Dataset_Cricket_Anthro and Fitness_2020.xlsx (Anthropometric and physical fitness variables).

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](#) (CC-BY 4.0).

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Version 1

Reviewer Report 15 December 2021

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Leonidas Petridis

Research Centre for Sport Physiology, University of Physical Education, Budapest, Hungary

The authors conducted a study with cricket players, which may be interesting to readers, primarily regarding performance determinants and the physical demands of cricket. While acknowledging the value of the descriptive data provided in the manuscript, an important aspect to consider is how the results in the fitness tests reflect the physical demands of the game. Does better performance in the fitness tests indicate better performance in cricket? The initial question is very promising: what are the factors that influence cricket performance? This aspect should be better discussed and analysed in the manuscript. Also, the authors should explain in the introduction the need to compare performance indicators between elite and sub-elite players, discussing the potential of the fitness tests to discriminate between players from various competition levels. Most probably elite players have better results when compared to sub-elite players, but is there any evidence to support this? Such an analysis could strengthen the rationale of the study also providing to coaches and practitioners some benchmark values in the applied fitness tests based on competition level.

Abstract:

- The abstract should contain the most important results rather than *p* values. The conclusion that cricketers with lower body height are less superior than their taller counterparts is not adequately supported by the results. Please reconsider or explain.

Introduction:

- The introduction contains several paragraphs with a general description of anthropometric and physical test measurements. These paragraphs seem redundant and should be removed. The authors should rather include reports from the literature with reference to cricket performance, to the physical demands of this sport, and to characteristics of elite cricket players.
- Please remove subheadings from the introduction.
- The authors mention that excess body mass reduces ground reaction forces for batsmen. Is

this correct? Increase in body mass increases ground reaction forces, this is a general rule. Please reconsider this statement and correct accordingly.

- The rationale of the study should be better explained. Why to conduct such a data collection? Although the authors aim to examine how performance in fitness test influence success in cricket, there is no reference to this aspect in the rest of the manuscript. Please clarify the purpose of the study according to the collected data and to the analysis you have conducted.

Methods:

- Please add background information for the participants: age, training background, weekly training load.
- Please add a detailed description of the protocols and the devices you used for measuring power, strength, aerobic capacity, and agility.
- Please add effect size measurements to support student *t*-test statistics.

Results:

- What was the reason to use 1.7m as a cut off value for body height categories? Please, explain. Moreover, the authors mention that short category included players with body height below 1.7m. The mean value for stature of short players however was 1.71 ± 0.05 m (table 1). How is this possible?
- Also, you need to explain why you used body height as a discriminator factor to divide participants. Is there a reference to support this?
- Having similar body fat, taller individuals are usually heavier than shorter individuals. This is not the case in this study; however, this result is not mentioned, nor discussed at all throughout the manuscript.
- Measurement unit for medicine ball throw is cm. This seems not to be correct, please check.

Discussion:

- The discussion needs revision. The results should be analysed in more depth, referring to their practical application in cricket game performance. Analysis should be sport-specific. The discussion should also include the relevance of body height in cricket performance.
- Please avoid repeating the results in the discussion.
- The authors highlight the significant difference in body height between short and tall groups. This is more than obvious, since body height was used to separate the two groups. This is not a result of the measurements, but a result of the methodology used.
- Short and tall groups differed only in agility test. This indicates that body height has limited effects on performance in fitness tests. What does this mean regarding cricket performance? These results deserve more discussion.

- Reference to normative data should be supported by data from the literature. Also, some numeric values from normative data could help to better understand these differences.
- Based on table 4, batsmen and bowlers differ only in the vertical jump test. Does this refer to similar fitness profiles between these two playing positions? The authors mention that batsmen have superior aerobic fitness compared to bowlers, but this was not confirmed by the results. Please, reconsider. Also, is there a reference to support the connection of aerobic fitness with improved recovery in cricket? How specific is the yo-yo fitness test to measure aerobic capacity in cricket?

Conclusions:

- The authors mention that cricketers with lower body height are less superior than those with higher body height. How is this supported from the results? This should be better explained.
- Please provide a more extensive explanation on how can coaches use this data for selection or training purposes.

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

No

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Sport science, fitness testing, neuromuscular performance

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

<https://doi.org/10.5256/f1000research.58865.r91648>

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Takalani Clearance Muluvhu

Department of Sport, Rehabilitation and Dental Sciences, Tshwane University of Technology, Pretoria, South Africa

Abstract:

1. In the background, maybe shorten the opening statement and only include: *"The scientific research into the varied factors that influence cricket performance has become a focal area for overall improved performance"*. Remove the entire second statement which you can insert at the end of the introduction to address your problem and why you choose to research in this area, which will be able to clarify the rationale of the study. *(Although there has been documented evidence for both anthropometry and physical fitness among elite cricketers, there is a paucity of evidence among the club cricket cohort.)*
2. Include study design on the methods within the abstract. And then indicate that '*Retrospective data were collected from the university's male first cricket team of the 2019/2020 season.*'

Introduction:

1. The introduction needs to be revised: avoid headings in the introduction. Make sure your introduction flows while including all parameters of the article that was written in different headings.
2. The authors are applauded for using current literature in the introduction, however addressing the above concern will solidify the introduction.

Methods:

1. Study design - the only concern is the number of participants, which, if expanded, will surely lead to a valid result, which will represent a large cohort and address the physical fitness characteristics measured. Surely it will lead to bias results due to small sample used?
2. Data collection - The authors are commended in terms of explaining how data was collected, the method was clearly explained. However, there is missing information in terms of how the following parameters were measured ((explosive power, strength, aerobic capacity, speed, and agility) and anthropometric (body mass index (BMI) and skinfolds) parameters). The authors should expand in this area to give readers an idea on how these parameters were measured.
3. Statistical analysis - The statistical analysis of the study is well explained in terms of how the data will be analysed and which statistical methods was applied/done. The authors are commended in this area.
4. Results and discussion- The results of the study were well presented in tables addressing all the parameters measured and the discussion the article was in line with the findings of the study.

5. Conclusion - the authors are commended on the way they crafted the conclusion to summarize the findings of the study, finally and well capturing of the recommendations of the study.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Physical activity, health, wellness and cardiometabolic risk factors.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

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