







# Hand grip strength test is not an indicator of flexibility performance among teenagers

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## ABSTRACT

There are some opinions that say the hand grip strength test can be a good predictor of the overall fitness of an individual. How correct is that? Thus, the main aim of this study is to investigate the relationship between hand grip strength test results with flexibility level as measured by the sit-and-reach test. For the purpose of this study 69 teenagers aged 18 to 23 years old mean  $\pm$  SD = (19  $\pm$  2.7), with body weight mean  $\pm$  SD = (64.49  $\pm$  13.47 Kg) and height mean  $\pm$  SD (163.82  $\pm$  8) have been recruited voluntarily. All participants performed two times hand grip test on their dominant hand, and the best performance was selected for further analysis. Participants then performed three trials of the sit-and-reach test with only the best performance recorded for analysis. The Pearson-correlation was used to analyse the data. Results indicated weak or no correlation between hand grip strength performance with sit-and-reach performance ( $r = 0.08$ ,  $p > .01$ ). It can be said that muscular strength performance measured by hand grip strength test may not be used to also indicate flexibility performance. Further studies are suggested to be performed on other age groups and other fitness components.

**Keywords:** Performance analysis, Hand Grip, Flexibility, Sit-and-Reach.

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## INTRODUCTION

Physical fitness and health assessments in adolescents are of significant interest to researchers and healthcare professionals alike. Understanding the relationship between different measures of physical performance can provide valuable insights into the overall health and well-being of teenagers. In this context, we examine the correlation between two commonly used fitness tests, Hand-Grip strength and Sit-and-Reach flexibility, among a group of 69 male and female teenagers.

Hand-Grip strength is often considered a marker of upper body strength, while the sit-and-reach test assesses flexibility in the lower back and hamstrings (Stroope, J. 2023). These tests are commonly used in physical education and health promotion programs to evaluate the fitness levels of adolescents. However, the extent to which performance in one test relates to performance in the other is an area that warrants investigation.

This study aims to shed light on the potential relationship between Hand-Grip strength and Sit and Reach flexibility among teenagers. We analyse data collected from 69 participants, examining descriptive statistics, correlation coefficients, and significance levels to determine whether there is a meaningful association between these two fitness parameters.

To conduct this analysis, we draw upon established statistical methods, such as Pearson's correlation coefficient, to quantify the degree and significance of the relationship between Hand-Grip strength and Sit-and-Reach flexibility. The findings of this study may have implications for physical education programs and health assessments in adolescents, contributing to a more comprehensive understanding of their physical fitness and potential health risks.

## MATERIALS AND METHODS

In our study, a group of 69 diploma-level students participated voluntarily as subjects as shown in Table 1. The study commenced with the collection of anthropometric measurements, encompassing variables such as weight and height, for each participant. Subsequently, participants were instructed to perform the hand grip strength assessment utilizing a specialized hand grip device. This procedure involved two successive attempts at hand grip strength measurement, with an intertrial interval of 15 seconds to mitigate potential fatigue effects. Following the completion of the hand grip assessment, participants were granted a resting period of 10 minutes to alleviate any physiological stress before proceeding to engage in the Sit-and-Reach exercise. Similar to the hand grip strength evaluation, the Sit-and-Reach exercise entailed two trials for each participant. Notably, for both the hand grip strength test and the Sit-and Reach exercise, the superior performance from the multiple attempts was selected as the datum for subsequent analytical scrutiny.

Table 1. Anthropometry.

|        | <b>N</b> | <b>Minimum</b> | <b>Maximum</b> | <b>Mean</b> | <b>Std. Deviation</b> |
|--------|----------|----------------|----------------|-------------|-----------------------|
| Weight | 69       | 43.20          | 103.10         | 64.4986     | 13.47947              |
| Height | 69       | 147.30         | 181.90         | 163.8290    | 8.00531               |

The data amassed from this research endeavours were subjected to rigorous statistical analysis. Utilizing IBM-SPSS, we conducted nonparametric tests to examine the relationships and patterns inherent in the dataset. These analytical methods were employed to ascertain the extent and significance of any

associations between the measured variables, ultimately contributing to a comprehensive understanding of the study's findings.

## RESULTS

**Hand-Grip:** The participants in the study scored around 32.80kg in the Hand-Grip exercise, with individual scores varying by about 9.12kg from this average.

**Sit-and-Reach:** They scored around 35.94cm in the Sit and Reach exercise, with individual scores varying by about 6.39cm from this average.

The correlation coefficient between Hand-Grip and Sit and Reach is approximately 0.084. as shown in Table 2.

Table 2. Descriptive and correlation analysis.

| Hand-Grip Test (Kg) (Mean ± SD) | Sit and Reach (cm) (Mean ± SD) | Pearson Correlation |
|---------------------------------|--------------------------------|---------------------|
| 32.80 ± 9.12                    | 35.94 ± 6.40                   | .084                |

This correlation coefficient tells us that there is a very weak positive relationship between Hand-Grip and Sit and Reach scores. In other words, when Hand-Grip scores go up, Sit and Reach scores tend to go up slightly as well. However, this relationship is extremely weak.

A significance value helps us determine if the observed correlation is likely to be just due to random chance or if it represents a true relationship. In this case, a significance value of 0.494 is relatively high. It suggests that the observed correlation is not statistically significant. This means that the weak relationship we observed between Hand-Grip and Sit and Reach scores could easily have occurred randomly, and we cannot confidently say it's a meaningful relationship.

Covariance measures how the two variables vary together. A positive covariance (83.085) indicates that as Hand-Grip scores increase, Sit and Reach scores also tend to increase, but the strength of this relationship is quite weak.

In simpler terms, the data shows that there is a very weak positive connection between the Hand-Grip and Sit and Reach exercises among the participants. However, this connection is so weak that it might just be due to chance, and we cannot confidently conclude that one exercise significantly influences the other. Other factors not considered in this study may have a more substantial impact on the teenagers' performance in these exercises.

## DISCUSSION

The examination of the correlation between Hand-Grip strength and Sit and Reach flexibility among the sample of 69 male and female teenagers yielded interesting insights into the relationship between these two physical fitness measures. While these assessments are commonly used to evaluate different aspects of physical fitness, our findings suggest that the association between Hand-Grip strength and Sit and Sit-and-reach flexibility in this adolescent population is remarkably weak. The Pearson correlation coefficient of approximately 0.084 indicates a negligible positive correlation between the two variables (Pan, et al 2022).

This weak positive correlation is consistent with the notion that upper body strength (Hand-Grip) and lower body flexibility (Sit-and-Reach) represent largely independent components of physical fitness during adolescence. While both are important aspects of overall fitness, our results imply that excelling in one area does not necessarily predict performance in the other. These findings align with previous research that has demonstrated the multifaceted nature of physical fitness and the need for comprehensive assessments that encompass various aspects of health (Christmas, et al 2019).

The lack of statistical significance further emphasizes the limited practical relevance of the observed correlation. With a two-tailed significance value (Sig.) of approximately 0.494, our data suggests that the correlation between Hand-Grip strength and Sit and Reach flexibility could easily have occurred by a fluke. This implies that other factors not considered in this study may have a more substantial impact on these teenagers' performance in these exercises (Portney, et al 2009).

One possible explanation for the weak and nonsignificant correlation is that physical fitness is influenced by a wide array of factors, including genetics, lifestyle, and overall physical activity levels. Adolescents' physical development is characterized by rapid changes in muscle strength, flexibility, and coordination, and these changes may occur at different rates in various parts of the body (Beunen, et al 1988) (Castro-Piñero, et al 2010). Therefore, it is reasonable to expect that Hand-Grip strength and Sit and Reach flexibility do not strongly correlate during this stage of development.

Moreover, the participants in this study represented a diverse group of teenagers, including both males and females. Gender differences in physical fitness are well-documented, with males typically displaying greater upper body strength and females often demonstrating greater flexibility (Brazo-Sayavera, et al 2021) (Ward, et al 2005). This natural variability within the sample may have contributed to the weak correlation observed.

Our analysis of the correlation between Hand-Grip strength and Sit-and-Reach flexibility in a group of 69 male and female teenagers indicates a very weak and statistically nonsignificant relationship between these two physical fitness measures. These findings underscore the complexity of physical fitness in adolescence and suggest that a holistic approach to fitness assessment, encompassing various dimensions of health, maybe more informative for health practitioners and educators.

## CONCLUSIONS

In the exploration of the correlation between Hand-Grip strength and Sit and Reach flexibility among a diverse group of 69 male and female teenagers, it becomes evident that the relationship between these two aspects of physical fitness is notably weak and statistically nonsignificant. The data revealed a negligible positive correlation coefficient of approximately 0.084, along with a two-tailed significance value of approximately 0.494, indicating that the observed correlation could easily have arisen by chance.

These findings offer valuable insights into the multifaceted nature of physical fitness during adolescence. It is apparent that while Hand-Grip strength and Sit and Reach flexibility are both important components of physical health, they represent distinct aspects of fitness that do not strongly covary within this age group. This suggests that excelling in one area of physical fitness does not necessarily translate to proficiency in the other, and a more comprehensive approach to assessing adolescent health and fitness may be warranted.

The weak correlation observed could be attributed to a multitude of factors, including the rapid and asynchronous growth patterns in strength and flexibility during adolescence, individual variations in physical development, and potential gender differences in these attributes. This underscores the complexity of physical fitness in this age group, emphasizing the importance of considering a broader range of health indicators when evaluating teenagers' overall well-being.

In conclusion, the data analysis and discussion presented here highlight the nuanced nature of physical fitness in male and female teenagers. While Hand-Grip strength and Sit and Reach flexibility are valuable measures, their limited correlation in this study suggests that a more holistic approach to assessing and promoting adolescent health and fitness is necessary. Future research could explore additional factors that contribute to physical fitness and health during this critical period of growth and development.

## **AUTHOR CONTRIBUTIONS**

Ahmad Alhussin Alali: Study design, data collection, statistical analysis, manuscript preparation. Jiang Wen Ming: Data collection, statistical analysis, manuscript preparation. Nor Fazila Abd Malek: Data collection, statistical analysis, manuscript preparation. Mohd Hafizuddin Bak: Study design, data collection, statistical analysis. Nur Ikhwan Mohamad: Study design, data collection, statistical analysis, manuscript preparation.

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## **DISCLOSURE STATEMENT**

No potential conflict of interest was reported by the authors.

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