

Anthropometric, Socioeconomic and Lifestyle Determinants of Dominant Hand Grip Strength Among Haryana Youth

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Abstract

The strength of the hand is an essential measure of the fitness of the muscles and the health of the body. In the present study, the authors have studied the anthropometric, socio-economic and lifestyle parameters of dominant hand grip strength in young age group (17-26 years) of state of Haryana. It was a quantitative cross-sectional study and data was collected from 1010 respondents from Haryana, India. Information about age, height, weight, body fat percentage, Body Mass Index (BMI), physical activity and family economic position, and territorial area was collected. Body composition was measured by the Bioelectrical Impedance Analysis and hand grip strength was measured by hand dynamometer. Descriptive statistics and Pearson correlation analysis were done using IBM SPSS Statistics and one-way ANOVA. The body fat percentage was significantly negatively associated with grip strength ($r = -0.745$), while weight ($r = 0.721$), height ($r = 0.614$), and BMI ($r = 0.541$) had significantly positive associations. Significant difference ($p < 0.05$) was noted among the various categories of physical activity, the various categories of family economic status and the various regions of residence. The findings indicated that amongst the various factors related to muscular strength, body composition and physical activity emerged as the most important ones in case of Haryana adolescents.

Keywords: Hand Grip Strength, Norms, Youth, Lifestyle, SES

Introduction

Hand grip strength (HGS) has been shown to be an easy and reliable, non-invasive indicator of the fitness of hand muscles, functional capacity and well-being. Grip strength is not only applied as a measurement of upper-limb strength, but has also been widely applied as a marker for physical performance, and linked to nutritional status, body composition, physical activity behaviour, and long-term health outcomes. Given its practical utility and close association

with the function of the entire musculoskeletal system, the assessment of grip strength is becoming a more common method in sports science, health promotion, rehabilitation, and population fitness monitoring. Several biological, behavioural, and environmental factors lead to an increase or decrease in muscular strength. Wyszowski's research has shown that anthropometric parameters, such as height, weight, body composition, and Body Mass Index (BMI) affect the force production capacity. Other factors, called lifestyle factors,

also contribute to muscle development and upkeep, including levels of physical activity. Socio-economic and environmental factors can also play a role in physical fitness, as they can impact on nutrition, recreational activities, employment and health behaviors.

There are a number of studies carried out worldwide on various factors responsible for the development of hand grip strength but the data available from the Indian population is not in abundance. Furthermore, the socio-economic status, lifestyle and physical activity vary greatly from region to region and regional studies are required. Haryana is a special scenario, having both rural and urban populations with different economic statuses and different levels of physical activity among the youth. Therefore, the present study was carried out to explore the anthropometric, socio-economic and lifestyle factors which are associated with dominant hand grip strength among youth of age 17-26 years in Haryana. That study explored the association between age, height, weight, body fat percentage, BMI, physical activity, family economic status, and region of residence and dominant hand grip strength. Understanding these relationships can be used to more accurately understand the muscular fitness and inform the development and implementation of evidence-based strategies to improve health and physical performance in youth.

2. Materials and Methods

2.1 Study Design and Setting

Quantitative cross-sectional studies are common for the purpose of exploring relationships between health-related variables and to offer a snapshot of the population at one particular point in time (Slater and Hasson, 2025). In the present study, quantitative, cross-sectional, descriptive, and analytical research designs were used to explore the anthropometric, socioeconomic, and lifestyle factors associated with dominant hand grip strength of youth from Haryana, India. . The

advantage of the cross-sectional approach was that the participants aged 17 to 26 years and their muscular and functional capacity will be at its peak at that age. This led to the collection of data from different education institutions, colleges, and universities of various Haryana districts and a diversified spectrum of demographic and socioeconomic groups.

2.2 Participants and Sampling

Population-based studies rely on the representativeness and reliability of the findings to be achieved when selecting participants and using sampling procedures appropriately (Raifman et al., 2022). The study was conducted on the target population of the age group 17-26 years in the residents of Haryana. Students, skilled workers, and employed people participated. In view of the widespread geographical area of Haryana and the lack of a comprehensive sampling frame, the non-probability sampling method called convenience sampling technique was used. An attempt was made to represent the sample across the gender, physical activity, family economic, and residential region categories.

Inclusion Criteria

- Individuals aged between 17 and 26 years.
- Residents of Haryana.
- Willing participants who provided informed consent.
- Individuals capable of completing anthropometric and grip strength assessments.

Exclusion Criteria

- Individuals reporting acute upper-limb injuries at the time of assessment.
- Participants with poor general health conditions that could influence grip strength measurements.
- Incomplete responses for key study variables.

2.3 Sample Size

After all, 1010 participants were included. The sample size was considered adequate for

making generalisations and for performing inferential statistical testing. There were no absenteeism data reported for any of the main study variables.

2.4 Data Collection Procedure

Standardised data collection procedures are vital to reduce measurement error and to have consistency across participants (Clayson, 2024). Structured data reports cards were used to gather data on demographic data, physical activity status, family economic status, body composition characteristics, and grip strength measures. The participants were selected from various colleges, universities, and educational institutes of Haryana All the participants were volunteers and informed consent was obtained prior to the collection of data. Confidentiality and anonymity was ensured throughout the study.

2.5 Study Variables

Identification of dependent and independent variables offers a way of understanding relationships between the outcomes and influencing factors (Herdian et al., 2022). Dominant hand grip strength (kg) was the dependent variable. Anthropometric, lifestyle, and socioeconomic variables were used as independent variables. The anthropometric variables analyzed were age, height, weight, body fat percentage and Body Mass Index (BMI). Physical activity level (mild, moderate and vigorous) were considered as lifestyle factors. Socio-economic factors were family economic status (as per Haryana Government classification of income categories) and residential area (rural/urban).

2.6 Measurement Instruments

Hand dynamometry has been used extensively and is a well-known, practical tool for measuring muscular strength in epidemiological and fitness studies (Wilkinson et al., 2022). A calibrated hand dynamometer was used to measure hand grip strength. Grip strength was measured for both hands, and dominant hand

grip strength was considered the main outcome variable. All participants were tested in the same manner so that there was consistency in measurement.

Body composition was measured by a non-invasive method, called Bioelectrical Impedance Analysis (BIA), which uses a small electrical current to measure the resistance of the tissue, which is an indicator of body composition (Branco et al., 2023). The technique included estimates of body fat % and other body composition variables. Standard anthropometric methods were used for height and weight measurement, and BMI was derived from the measurements taken.

2.7 Statistical Analysis

The use of appropriate statistical techniques is required to summarise data, assess relationships between variables, and objectively test research hypotheses (Barroga and Matanguihan, 2022). IBM SPSS Statistics was used for data analysis. The study variables and characteristics of the participants were summarized using descriptive statistics such as mean, standard deviation, frequencies, and percentages.

The relationships between anthropometric measurements (age, height, weight, body fat percentage, and BMI) and dominant hand grip strength were examined using Pearson correlation analysis.

The differences in dominant hand grip strength between gender, physical activity level, family economic status categories, and residential region were evaluated using One-way Analysis of Variance (ANOVA). Kolmogorov–Smirnov tests, Shapiro–Wilk tests and Levene's tests were used to test the assumptions of normality and homogeneity of variance prior to conducting ANOVA. The sample size was large and the ANOVA was not normally distributed, but the large sample size made the ANOVA a desirable technique to handle deviations from normality.

When results of a significant ANOVA are obtained, post hoc procedures are recommended

to determine which group differences can account for the overall statistical significance (Agbangba et al., 2024). If there were statistically significant group differences, post-hoc analyses were used to determine specific differences between groups. When the assumptions of homogeneity of variance were not met, Games–Howell post-hoc tests were used.

The statistical tests and significance level used were two-tailed, with statistical significance set at $p < 0.05$.

3. Results

3.1 Participant Characteristics

Overall, 1010 participants (aged 17-26) took part in the study. The mean age of all the participants was 20.53 years (S.D. = 2.39 years). The average height and weight were 169.22 cm (SD = 7.99 cm) and 66.99 kg (SD = 10.53 kg), respectively. Participants had a mean body fat percentage of 22.79% (SD = 5.65%) and a mean BMI of 23.28 kg/m² (SD = 2.44 kg/m²). The mean of the dominant hand grip strength was 34.79kg (SD = 10.89kg).

Table 3.1: Descriptive Statistics of Continuous Variables

Variable	N	Min	Max	Mean	SD	Skw	Kt.
Age (years)	1010	17	26	20.53	2.393	0.379	-0.680
Height (cm)	1010	142.00	196.00	169.22	7.995	-0.089	0.198
Weight (kg)	1010	36.20	106.00	66.99	10.531	0.109	-0.291
Body Fat (%)	1010	11.40	42.60	22.79	5.648	-0.144	0.944
BMI (kg/m ²)	1010	14.36	34.61	23.28	2.439	0.277	0.420
Dominant Grip Strength (kg)	1010	13.40	67.10	34.79	10.885	0.369	-0.981

Note: SD = Standard Deviation; Skewness and Kurtosis values are standardised

The sample consisted of 564 males (55.8%) and 446 females (44.2%). Most of the participants were from the rural areas (73.6%) and 26.4 % from the urban area. The majority of participants said that they were moderately active (56.1%), followed by vigorously active (31.9%) and mildly active (12.0%). Considering family economic status, the majority were middle class family (42.9%) followed by the below poverty line (BPL) families (38.6%). The

BMI distribution showed that 39.3% were of normal weight and of which, 38.4% were overweight, 14.9% were obese and 7.4% were underweight.

3.2 Correlation Between Anthropometric Variables and Grip Strength

Pearson correlation analysis was carried out to evaluate the correlation between dominant hand grip strength and anthropometric parameters.

Body fat percentage showed the highest coefficient with grip strength ($r = -0.745$, $p < 0.01$), which means that there was a negative correlation between body fat percentage and grip strength. It is a good negative correlation and indicates that body composition is one of the most significant parameters associated with muscular performance.

There was a significant positive correlation between weight and grip strength ($r = 0.721$, $p < 0.01$). A positive correlation was found between body weight and the grip strength value of participants. Likewise, grip strength was positively associated with height ($r = 0.614$, $p < 0.01$), indicating that taller people had greater muscular strength.

BMI was moderately positively associated with grip strength ($r = 0.541$, $p < 0.01$). Strength of grip tended to increase with BMI value; caution should be used when interpreting this finding due to the fact that BMI does not differentiate between lean body mass and fat mass.

The grip strength was found to be weakly correlated with age ($r = -0.219$, $p < 0.01$). Within the age range 17-26, the grip strength values were slightly lower in older age groups as compared to the younger age groups.

Overall, the results indicated that the body composition variables had the strongest correlations with hand grip strength for the dominant hand with body fat percentage and weight.

Table 3.2: Pearson Correlation Matrix for Dominant Grip Strength and Anthropometric Variables

Variable	Age	Height
Age (yrs)	1.000	-.128**
Height (cm)	-.128**	1.000
Weight (kg)	-.177**	.771**
Body Fat (%)	.275**	-.631**
BMI (kg/m ²)	-.162**	.274**
Grip Strength (kg)	-.219**	.614**

Note: ** Correlation is significant at the 0.01 level (2-tailed)

3.3 Association Between Physical Activity Level and Grip Strength

To compare differences in grip strength among physical activity categories, one-way ANOVA was performed.

Results of the analysis showed that there were statistically significant differences between the three physical activity groups [$F(2,1007) = 75.79$, $p < 0.001$]. Participants who reported to be engaged in vigorous physical activity had the highest mean grip strength (39.57 kg), moderate physical activity (33.78 kg) and mild physical activity (26.81 kg).

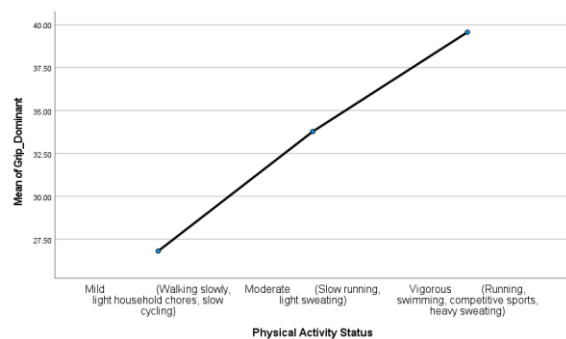


Figure 3.1: Means Plot of Dominant Grip strength by Physical Activity level

The results show a significant increase in grip strength as the intensity of physical activities increases. Post-hoc comparisons also revealed all group differences to be significantly different. The findings of this research suggested that youth of Haryana has a good association between the level of physical activity and muscular strength.

Table 3.3: Descriptive Statistics and ANOVA Results for Grip Strength by Physical Activity Level

Physical Activity Level	N	Mean (kg)	SD (kg)	Min	Max
Mild (Walking, light chores)	121	26.81**	7.59	13.40	46.00
Moderate (Slow running, light sweating)	567	33.78**	9.44	18.60	60.00
Vigorous (Running, competitive sports)	322	39.57**	12.05	20.00	67.10
Total	1010	34.79	10.88	13.40	67.10

3.4 Association Between Family Economic Status and Grip Strength

The differences in dominant hand grip strength between family economic status categories were analysed using one-way ANOVA.

This result showed that the difference in the results among the various economic groups was statistically significant [$F(4,1005) = 6.94$, $p < 0.001$]. Among those having different income classifications, the highest mean grip strength was observed among the BPL group (37.90 kg), followed by the middle income group (34.72 kg), the upper-middle income group (30.32 kg), AAY (32.43 kg), and the lowest among the highest income group (30.32 kg).

Table 3.4: Descriptive Statistics and ANOVA Results for Grip Strength by Family Economic Status

Family Economic Status	N	Mean (kg)	SD (kg)	Min	Max
AAY (₹0–1 lakh/annum)	61	32.43	9.97	13.40	59.00
BPL (₹1–1.80 lakh/annum)	390	36.10	10.12	16.90	57.60
Higher Income (>₹10 lakh/annum)	30	37.90	15.04	20.00	60.70
Middle Income (₹1.80–5 lakh/annum)	433	34.72	11.24	19.00	62.40
Upper Middle Income (₹7–10 lakh/annum)	96	30.32	9.92	20.00	67.10
Total	1010	34.79	10.88	13.40	67.10

The BPL showed significant differences from the upper-middle income group, and the middle-income group also showed significant differences from the upper-middle income group according to the Games–Howell post-hoc analysis. The overall pattern was not a simple linear socioeconomic gradient. Rather, it was found that the grip strength was affected by both

economic status and lifestyle.

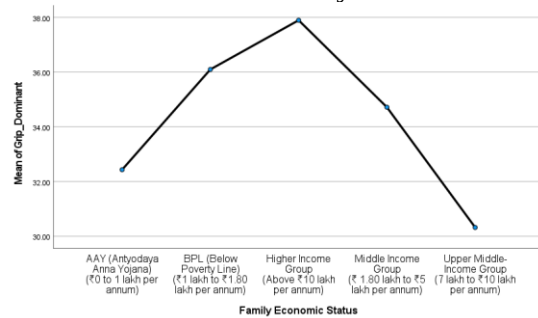


Figure 3.2: Means Plot of Dominant Grip Strength by Family Economic Status

3.5 Rural–Urban Differences in Grip Strength

One-way ANOVA was used to look at the association between region of residence and dominant hand grip strength.

Table 3.5: Descriptive Statistics and ANOVA Results for Grip Strength by Region

Region	N	Mean (kg)	SD (kg)	Min	Max	95% CI
Rural	743	34.33	10.89	13.40	67.10	33.54 – 35.11
Urban	267	36.09	10.78	20.00	62.40	34.79 – 37.38
Total	1010	34.79	10.88	13.40	67.10	34.12 – 35.46

ANOVA output: $F(1, 1008) = 5.16$, $p = 0.023$; Sum of Squares Between = 608.67, Mean Square Between = 608.67.

The analysis showed a statistically significant difference between the rural participants and the urban participants [$F(1,1008) = 5.16$, $p = 0.023$]. The mean grip strength of the urban participants was 36.09 kg and 34.33 kg for the rural participants.

The difference was statistically significant, but was small relative to the size of the difference (1.76 kg). However, the results indicated that there could be some difference in the muscular strength of young adults of Haryana due to regional variations.

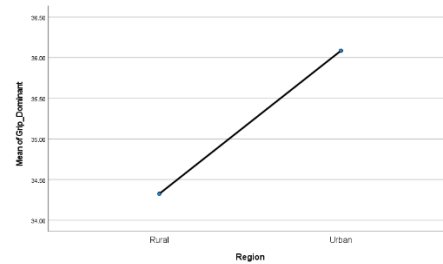


Figure 3.3: Means Plot of Dominant Grip Strength by Region

3.6 Major Factors Associated with Grip Strength

The results are consistent and show a relationship between anthropometric, lifestyle, socio-economic, and regional characteristics and dominant hand grip strength.

The anthropometric variables were found to be related to grip strength most strongly by body fat percentage ($r = -0.745$) and then weight ($r = 0.721$), height ($r = 0.614$), and BMI ($r = 0.541$). The age association was found to be weak, with a value of $r = -0.219$.

The most influential lifestyle-related factor was physical activity level, with grip strength gradually increasing as physical activity went from mild to moderate to vigorous. Large ANOVA and clear group differences indicate a strong relationship between physical activity behaviour and muscular strength.

Family economic status also showed a significant association with grip strength, but in a non-linear fashion. Relatively high grip strength values were found for participants in higher income and BPL categories compared to some middle income categories.

The regional differences were statistically significant but relatively small; urban participants had a slightly higher grip strength than rural participants.

From the strength of the correlations and the differences in the means of each group that were noted in this study, the following order of association with grip strength can be surmised:

1. Body fat percentage
2. Weight
3. Physical activity level

4. Height
5. BMI
6. Family economic status
7. Region

The present results indicate the multi-dimensionality of grip strength and indicate that body composition and physical activity are closer to muscular strength than the socio-economic and regional factors.

4. Discussion

4.1 Overview of Key Findings

The current research aimed to explore the anthropometric, lifestyle, socioeconomic, and regional characteristics linked with the grip strength of the dominant hand in the youth age group of 17 to 26 years of the state of Haryana. The results showed that there were significant associations between grip strength and a number of participant characteristics. Body fat percentage was the best correlate of grip strength, followed by weight, height, and BMI among anthropometric variables. There was also a significant association between physical activity levels and grip strength; vigorous physical activity was associated with significantly higher grip strength values than moderate and mild physical activity. Further differences were found within the categories of family economic status and between those living in rural and urban communities. These results highlighted that both body composition and behavioural factors, in addition to socioeconomic factors, are related to muscular strength.

4.2 Anthropometric Determinants of Grip Strength

Height and Weight

The current study revealed high positive correlations between height and weight with the dominant hand grip strength. Weight was more correlated with grip strength than height, implying that people with higher weights tend to have higher muscular strength. Likewise, as was the case in the previous study, there were

greater values of grip strength recorded in taller participants than in shorter ones. The results show that the size and physical structure of the body have a significant influence on muscular performance in Haryana youth. Increased body size and overall mass may give a skeletal benefit in regard to the force-producing capacity, as evidenced by increased grip strength measures.

BMI

BMI was moderately and positively correlated with dominant hand grip strength. Generally, the higher the BMI value, the higher the strength value. But care must be taken with the meaning of this relationship, since BMI fails to distinguish lean tissue and fat tissue. In some people, a higher BMI could be a sign of increased muscle mass, and in others of increased adiposity. As a result, BMI can not account for all the differences in muscle strength.

Body Fat Percentage

Body fat percentage was the best anthropometric predictor of dominant hand grip strength. The correlation was high negative and meant that as body fat percentage increased, grip strength values decreased. . The results of this study are consistent with those of others who have shown that body composition is an important consideration in the determination of muscular performance, rather than just body size. There is no direct relationship between excess body fat and force production, but it could have a negative effect on movement efficiency and functional strength. The findings thus indicate that positive body composition is more important to muscular fitness than just gaining weight.

Age

Within the study population, there was a weak negative relationship between age and grip strength. . The age range was moderate (17-26 years) with the older group showing slightly lower Grip Strength values as compared to the younger group. This discovery indicates that

there are other maturational factors than biological ones, which affect strength in this age range. This observation may be partly attributed to the differences in physical activity patterns, education status, occupation, and lifestyle behaviours.

4.3 Lifestyle Determinants of Grip Strength

Physical Activity Level

One of the most significant behavioural factors for dominant hand grip strength was physical activity level. The group that was in the vigorous physical activity category had the highest mean grip strength, similar to the moderate physical activity and mild physical activity categories. The strength increases in a progressive manner among the different activity categories, indicating a definite relationship between the intensity of the activity and the level of muscular fitness. Moreover, there was a large difference between all groups of activities, suggesting that even moderate levels of physical activity are linked to significant improvements in muscle strength. The results emphasize the importance of regular physical activity, exercise to maintain the fitness of muscle tissue in young adults.

4.4 Socioeconomic Determinants of Grip Strength

Family Economic Status

Family economic status was shown to be significantly correlated with dominant hand grip strength, but in a non-linear fashion. Higher income level and BPL groups showed relatively higher values of grip strength than some of the middle-income groups. Based on these results, the economic status per se may not be the one that directly influences muscular strength. Rather, variation in the demands of a job, lifestyle behaviours, physical demands of the day, and recreational opportunities may explain some of the differences observed between income groups.

Regional Differences

The differences between people living in urban and rural areas were statistically significant. In urban youth, the mean values of grip strength were slightly higher than the mean values of grip strength in the rural youth. The difference wasn't that great, but it does suggest that the environment and lifestyle could be a factor in muscle fitness. The strength of grip was higher for urban participants, possibly because of the availability of organised sport facilities, structured exercise opportunities and health-related resources.

4.5 Comparison with Previous Studies

The results from the present investigation are comparable to the previously known fact that multiple biological, behavioural, and environmental factors affect the grip strength of the hand. The positive correlations found with height, weight, and BM, and the negative correlation with body fat percentage and grip strength suggest a central role for body composition in the performance of the muscles. Likewise, the greater grip strength reported by those who were very physically active is consistent with the body of evidence that suggests that routine physical activity is beneficial to muscle growth and functionality. Finally, observed socioeconomic and regional differences lend further support to the premise that muscular fitness should be seen in the larger social and environmental context rather than as a measure of physiological characteristics.

4.6 Practical Implications

Sports Science

The results show that body composition and physical activity are important factors in the development of muscular strength. Grip strength assessment can be used as a simple measure of overall muscle fitness and muscle training effectiveness in youth populations by coaches and sport practitioners.

Physical Fitness Assessment

Correlations of the anthropometric parameters with grip strength are highly positive, which allows the use of grip strength as a useful test in fitness assessment programmes. Grip strength might be useful to give a good indication of functional muscular capacity and health.

Youth Health Promotion

The importance of physical activity in the development of grip strength further highlights the importance of promoting physical activity and sports in general among children. The information can be used by schools, community groups, and health agencies for the development of active lifestyle and lifelong physical health promotion initiatives.

5. Conclusion

The present study aimed to analyse the anthropometric, socioeconomic, and lifestyle indicators related to dominant hand grip strength in Haryana, India, in 1,010 youth aged 17–26 years. It was found that there are several interrelated factors affecting the grip strength, which showed that grip strength is a multidimensional aspect of muscular fitness in young adults.

Among the anthropometric variables, body fat percentage exhibited the strongest association with dominant hand grip strength, showing a substantial negative relationship. On the other hand, there was a strong positive correlation between grip strength and weight, and a moderate correlation with height, whereas BMI showed a moderate positive correlation. The results of this study suggest that body composition is a more important factor in the performance of muscle than is body size. The negative correlation between age and grip strength is weak, meaning lifestyle and activity patterns could impact strength within a relatively narrow age window.

The muscular strength was also related to lifestyle factors. The participants who reported vigorous physical activity had the highest grip

strength values, while the moderate and mild activity level groups had the next highest grip strength values. This steady trend has indicated the significance of frequent and high doses of physical activity to maintain muscle fitness for young people.

Other factors, such as socioeconomic and regional characteristics, were also significantly related to grip strength. Muscular strength was not linearly related to family economic status, but there were significant differences between family economic status categories. Likewise, there was a slightly higher grip strength among the urban participants compared to the rural participants, indicating the possible effect of environmental and lifestyle factors on physical fitness outcomes.

In general, the results suggest that hand grip strength in the dominant hand is strongly related to body composition, physical activities of the youth, and some socio-economic factors of Haryana. The study confirms the utility of grip strength as a real-world measure of muscle fitness and stresses the significance of healthy body composition and physical activity in young people. The results of this study can be used for future fitness assessment programmes, youth health initiatives, and evidence-based interventions for enhancing muscular strength and overall fitness in the population of Haryana.

References

- Agbangba, C.E., Aide, E.S., Honfo, H. and Kakai, R.G., 2024. On the use of post-hoc tests in environmental and biological sciences: A critical review. *Heliyon*, 10(3). [https://www.cell.com/heliyon/fulltext/S2405-8440\(24\)01162-9](https://www.cell.com/heliyon/fulltext/S2405-8440(24)01162-9)
- Barroga, E. and Matanguihan, G.J., 2022. A practical guide to writing quantitative and qualitative research questions and hypotheses in scholarly articles. *Journal of Korean medical science*, 37(16). <https://doi.org/10.3346/jkms.2022.37.e121>
- Branco, M.G., Mateus, C., Capelas, M.L., Pimenta, N., Santos, T., Mäkitie, A., Ganhão-Arranhado, S., Trabulo, C. and Ravasco, P., 2023. Bioelectrical impedance analysis (BIA) for the assessment of body composition in oncology: a scoping review. *Nutrients*, 15(22), p.4792.

- <https://doi.org/10.3390/nu15224792>
Clayson, P.E., 2024. The psychometric upgrade psychophysiology needs. *Psychophysiology*, 61(3), p.e14522. <https://doi.org/10.1111/psyp.14522>
Herdian, H., Ridwan, R., Tusianah, R., Isnaini, U.C., Sulpakar, S., Zainaro, M.A., Hariri, H., Maydiantoro, A., Kesuma, T.A.R.P. and Zalmansyah, A., 2022. A literature review of followership as independent and dependent variables and the meaning. *International Journal of Education and Information Technologies*, 16, pp.92-100. <http://doi.org/10.46300/9109.2022.16.10>
Raifman, S., DeVost, M.A., Digitale, J.C., Chen, Y.H. and Morris, M.D., 2022. Respondent-driven sampling: a sampling method for hard-to-reach populations and beyond. *Current Epidemiology Reports*, 9(1), pp.38-47. <https://doi.org/10.1007/s40471-022-00287-8>
Slater, P. and Hasson, F., 2025. Quantitative research designs, hierarchy of evidence and validity. *Journal of Psychiatric and Mental Health Nursing*, 32(3), pp.656-660. <https://doi.org/10.1111/jpm.13135>
Wilkinson, T.J., Gabrys, I., Lightfoot, C.J., Lambert, K., Baker, L.A., Billany, R.E., Kanavaki, A., Palmer, J., Robinson, K.A., Nixon, D. and Watson, E.L., 2022. A

systematic review of handgrip strength measurement in clinical and epidemiological studies of kidney disease: toward a standardized approach. *Journal of Renal Nutrition*, 32(4), pp.371-381. <https://doi.org/10.1053/j.jrn.2021.06.005>

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