ORIGINAL RESEARCH PAPER

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ASSESSING THE ASSOCIATION OF HANDGRIP STRENGTH WITH BODY COMPOSITION AMONG YOUTH AT WSU

KEY WORDS: Handgrip Strength, Body Composition

Umapathy Ekambaram* III nCross Street, East Shenoynagar, Chenai, 600030, Tamilnadu, India. *Corresponding Author

Cebisa Bhadula Department Of Human Biology, Faculty Of Health Sciences, Walter Sisulu University, Mthatha, South Africa. 5100.

Namugowa Ambrose Department Of Human Biology, Faculty Of Health Sciences, Walter Sisulu University, Mthatha, South Africa. 5100.

ABSTRACT

This study was done to determine if handgrip strength (HGS) is associated with body composition among WSU students of Mthatha campus in Nelson Mandela Drive., South Africa. A total of 102 healthy students (50 females and 52 males) participated in the study. When the body composition parameters increased, HGS was low ($p<0.000$). Body composition is not associated with hand grip strength, as body composition parameters increases, the muscle become weaker and hand grip strength decrease.

INTRODUCTION

Handgrip strength [HGS] is said to correlate with general health status and it is used to screen for efficiency in cricket players [1]. Existing studies have indicated that HGS testing is a promising tool to screen for of several diseases. An individual's handgrip strength (HGS), measured by a hand dynamometer, has shown significant correlations with clinical conditions such as malnutrition, type 2 diabetes, functional disability, stroke hypertension and overall quality of life [2]. However, no studies have evaluated the association of HGS with body composition and the correlation between the HGS and body composition has not been reported. Therefore the aim of this study is to determine if handgrip strength is associated with body composition among student population aged 18-28yrs.

METHODS

Subject selection

102 Healthy volunteer students (age between 18-28 years) from Walter Sisulu University, Mthatha, South Africa (50 females and 50 males) were randomly selected after informed consent. Those who had history of chronic disease will be excluded. Those who had had any surgery on both their left and right arm, hand or wrist in the last three months or had arthritis or pain in both their left and right hand or wrist were excluded from the study.

Data collection

Anthropometric measurements

Height will be measured using electronic body scale TCS-200-RT without footwear. Participants were asked to take off their shoes and with light clothes, stand on Omron (BF511) and stretch their arms to the front at exactly right angle while holding on to the stretching part. Participant's details (Gender, age, and height) were recorded and their weight, BMI, body fat percentage, skeletal muscle, metabolic rate and visceral fat were measured by Omron by selecting the relevant button for each parameter.

Handgrip strength measurements

The subject held the Jamar® smart hand dynamometer (Manufactured by Patterson MedicalL Ltd) in the hand to be tested, with the arm at right angles and the elbow by the side of the body. The handle of the dynamometer was adjusted if required and the base should rest on first metacarpal (heel of palm), while the handle should rest on middle of four fingers. When ready the subject squeezed the dynamometer with maximum isometric effort, which was maintained for about 3 seconds and was recorded as handgrip strength in kilograms (kg). No other body movement was allowed. The subject was strongly encouraged to give a maximum effort.

Ethical considerations

The ethical clearance was obtained from the Walter Sisulu University ethical committeewith protocol number 061/2016. The information provided by participants in the study was confidential. All volunteering participants signed the consent form prior to participation and the study induced no harm to the subjects.

Data presentation and analysis

Statistical analysis was carried out using SPSS for statistix (version 8.1software). Pearson's correlation was used to determine the association of hand grip strength and body composition. Correlation was significant when $P < 0.05$. The results were expressed as mean ±SEM for normally distributed values and as median (range / inter-quartile) range for non-normal.

RESULTS

Table 1: Participant's characteristics of study group.

Variables	Females (n=50)	Males(n=52)	P value
AGE(years)	20.720±.38	21.462±.41	.191092
HEIGHT (cm)	160.000±1.07	170.700±.95	.000000
WEIGHT(kg)	66.252±1.83	70.438±1.91	.117477
Body Mass Index (kg/M²)	26.012±.78	24.174±.57	.058713
Basal Metabolic Rate (kcal/day)	1349.460±18.6	1596.740±51.32	.000021

Values recorded as Mean ± SEM. n is the number of participants p value is the significance level p is <0.05.

As seen in Table1 above, the height and Basal Metabolic Rate of males were significantly higher than those of females. BMI difference between males and females was not significant. There was no significant relationship when comparing ages of both genders.

In Table 2, the correlation between HGS and body composition was analysed. The correlation between HGS and body composition among males is statistically significant. And the coefficient (r value) is negative when HGS increases most body composition parameters also decrease except BMI (<0.05). As BMI increases, HGS also increases in males.

Table 2 Correlations between body composition and hand grip strength among males.

Body composition parameters	r-value	p-value
Waist/hip	-.061362	.675331
Body Mass Index (kg/m²)	.427142	.002206

Percentage of Body Fat	.258237	.073210
Percentage of Skeletal Muscle	-.200960	.166183
Basal metabolic rate(kcal/day)	.048942	.738418

r is Pearson correlation coefficient and p value is the significance level when p is <0.05.

Table 3: Correlations between body composition and HGS among all participants.

Body composition parameters	r-value	p-value
Waist/hip ratio	.353	.000
Body Mass Index (kg/m²)	.012	.906
Percentage of Body Fat	-.567	.000
Percentage of Skeletal Muscle	.687	.000
Basal metabolic rate(kcal/day)	.366	.000

r is Pearson correlation coefficient and p value is the significance level when p <0.05.

As seen in Table 3, there is significant correlation between HGS and body composition parameters (p<0.05) except percentage of body fat which is negative .

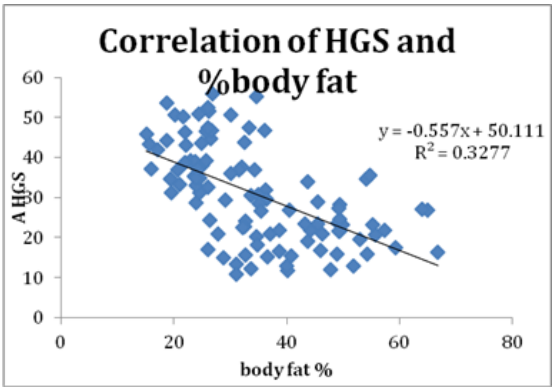

Figure1: Correlation of HGS with percentage of body fat.

There is moderate negative association between HGS and %BF, the dots fall far from each other.

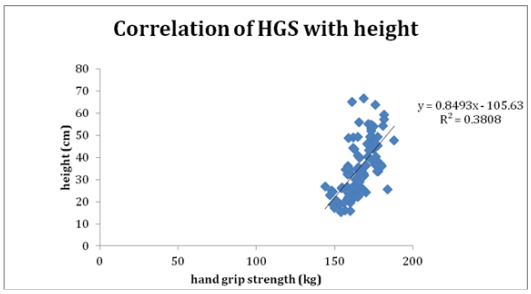

Figure2: Correlation of hand grip strength with height in all groups.

There is positive significant correlation between height and hand grip strength.

DISCUSSION

The aim of this study was to determine if handgrip strength is associated with body composition among WSU students. An overview of CVS risk factors burden in sub-saharan Africa was analysed [3].

The demographics of the study population were similar in age, weight and BMI, between males and females. However, males had higher height and basal metabolic rate than females. Males usually have a higher BMR than females (of the same age) because males tend to have a higher proportion of lean body mass than females of the same age. Conversely, females tend to have a higher proportion of fat cells and fat cells have a lower metabolic rate than lean muscle cells [4].

In this study it was found that hand grip strength was affected in the same way with body composition variables among different genders. Among both females and males hand grip strength (HGS) decreases when body composition parameters increases. Hand grip strength is inversely associated with waist/hip ratio which indicates the increase in visceral fat which decreases muscle mass and therefore the muscle strength, but Hand grip strength increases with height, tall people have larger muscles and their muscle strength is increased. This suggested that when the body composition parameters increased, HGS was low regardless of the gender differences. This was in coherence with the study of Lindblad et al., 2015[5] who found that body composition is associated with declining physical function.

It is also shown that height has a strong association with grip strength and when muscles increase in size, the amount of force they can produce also increases [6]. It is also pertinent to note that CVS risk factors have been reported in college students [7] in a different setting, making this study unique as this is the first of its kind in African setting.

CONCLUSION

Body composition is not associated with hand grip strength, as body composition parameters increases, the muscle become weaker and hand grip strength decrease.

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