



Original Research Article

Correlation of handgrip strength with aggression in adolescence

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ABSTRACT

Adolescence is a stressful phase of life which includes acceleration of physical growth, psychological and behavioral changes. There is transformation from childhood to adulthood. Most common problems among adolescence relate to growth and development, school, mental health disorders, consequences of risky and illegal behaviors including aggression. Hand Grip Strength (HGS) is a good marker of physical health and good muscle performance. Testosterone level contributes to HGS, which may explain the aggressive behavior in men with high HGS. Aim of our study was assessment of Handgrip strength and Aggression in first year medical students and to determine the correlation between handgrip strength and aggression. We included 149 medical students of first year medical students of MIMS Mandya in adolescent age group. Hand grip strength assessed by Handgrip Dynamometry and Aggression was assessed by Aggression Scale by G P Mathur and Bhatnagar. In our study Hand grip strength was significantly high in males compared to females. There was no statistically significant difference in Aggression among the gender. There was no significant correlation between the Hand grip strength and Aggression scores. HGS is mainly affected by testosterone and aggression need not have a positive correlation with HGS.

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1. Introduction

Adolescence is a distinct phase of life which has recently gained recognition with its own special needs. This phase characterized by acceleration of physical growth, psychological and behavioral changes. It is a phase of transition between childhood to adulthood. Adolescence is a transition period in life when an individual is no longer a child, but not yet an adult. Individual undergoes various physical and psychological changes including changes in social behaviour, perceptions, sexual maturation, intimate relationships. It is a stressful period of life with discernable physical, mental, emotional, social and behavioral changes. Issues of dependency, identity, sexuality and relationships define this stage.¹

Most common adolescent problems are regarding growth and development, school, mental health disorders, consequences of risky behaviors including injury, legal consequences, infectious diseases and substance abuse

disorders. Unintentional injuries from motor vehicle crashes and injuries from personal violence are one of the leading cause of death and disability among adolescents. Psychological adjustments being hallmark of this phase including eating disorders, depression, suicidal ideation, anxiety, obesity, smoking and violent behaviour.²

In Psychology, the term aggression refers to a range of behaviors that can result in both physical and psychological harm to self, others, or objects in the environment. This behavior intends on harming another person either physically or mentally. Aggression can be of different forms like verbal, physical mental and emotional. Purpose of aggression includes competition with others, to express dominant behavior, possessiveness, reaction to fear, to express anger and jealousy. Impulsive and Instrumental aggression are the two types mentioned in the literature. Impulsive aggression (affective aggression) has features of strong emotions like anger.³ This type is not a planned one and often takes place at the heat of the moment. This triggers acute threat response system involving amygdala,

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hypothalamus and periaqueductal gray (PAG)⁴ in the brain.

Instrumental aggression (predatory aggression) is characterized by behaviors intended to achieve larger goal. It is carefully planned one unlike the impulsive type. The different factors that influence the aggression, includes a) Biological – men are more likely to involve in physical aggression compared to women b) Environmental- people growing up with witnessing more forms of aggression are more likely to adapt to such type of behavior c) Physical-dementia, psychosis, alcohol abuse, drug use.³

Movements of the hand can be classified into two types a) Prehensile movements- in which an object is seized and held in hand, these involve movements of all the joints of the hand simultaneously engaging different group of muscles b) Non-Prehensile movements: in which objects are manipulated by pushing, tapping or lifting; these involve movements of individual digits. Prehensile movements are 2 types- Precision grip and power grip. Hand Grip Strength (HGS) is a good marker of physical health and good muscle performance, and an overall indicator of health status and vitality. Muscles involved are flexor digitorum profundus, flexor digitorum superficialis, flexor pollicis longus, extensor digitorum, lumbricals, interossei, flexor digiti minimi, and adductor pollicis. These muscles play important role in both power and precision grips & are supplied by median nerve except medial two lumbricals and adductor pollicis which are supplied by ulnar nerve.⁵ HGS is affected by a number of factors including age,⁶ gender⁷ body size and weight,⁸ and position of hand.⁹ HGS is also strongly influenced by genetic factors.¹⁰

Hormone Testosterone is primarily responsible for secondary sexual traits development and also strongly correlated to somatic feature and body strength. Aggressive behavior is also widely associated with high testosterone levels. Testosterone level contributes to HGS, which may explain the aggressive behavior in men with high HGS.¹¹ Smrithi et al¹² found that male students showed significantly higher HGS than female students. Nahida Shaban¹³ suggest that currently the pattern of aggression is changing and, in modern times, both males and females experience almost equal aggression.

With all these background studies we aimed at assessment of Handgrip strength and Aggression in first year medical students and to determine the correlation between handgrip strength and aggression.

2. Materials and Methods

We included 149 medical students of first year medical students of MIMS Mandya in adolescent age group (18 to 19 yrs) who give written informed consent, 74 male and 75 female students were included.

2.1. Exclusion criteria

Students diagnosed with medical or surgical condition, muscular disorder, hand pain or arthritis as per history. Hand grip strength assessed by Handgrip Dynamometry (In co Ambala, India). The students were asked to hold the dynamometer with dominant hand in standing position with shoulder adducted & neutrally rotated & elbow in full extension. It was held freely without support not touching subject's trunk. The position of the hand remained constant. The subjects were asked to put maximum force on the dynamometer & hold it for 3 seconds, the maximum value was recorded in kilograms. Aggression was assessed by Aggression Scale by G P Mathur and Bhatnagar. Each statement describes different forms of individual's aggression in different situations. It is a 55 item self report questionnaire with 5 point likert scale. It consists of 55 statements, 30 statements are positive and 25 statements are in negative form. Subject responses are measured on a five-point scale. In positive form score was given as 5, 4, 3, 2, 1 respectively and in negative form of statement scores was given as 1, 2, 3, 4, 5 respectively. The total score will be calculated by adding all the scores of individual items. The participants were informed everything about the aggression scale. There is no right and wrong response to the statement. No time limit was fixed for the test but usually an individual takes 25 to 30 minutes to complete this test. But it was compulsory to respond to each question.

2.2. Statistical analysis

MS excel was used for data entry and statistical analysis. Descriptive statistics like measures of central tendency, variation and percentage etc and inferential statistics like chi square test and co-relation and regression analysis and other suitable statistical tests was applied.

3. Results

In our study there was no statistically significant difference in Aggression among the gender. Most of them had average (41.6%) to high (54.4%) aggression scores. Hand grip strength was significantly high in males compared to females. There was no significant correlation between the Hand grip strength and Aggression scores.

4. Discussion

In our study 54.4 % had high aggression scores 41.6% had average aggression scores and only 4% had low aggression scores which is contradictory to the study by Kaur¹⁴ in which only 1% had severe aggression. There is no sexual dimorphism in aggression in our study. Both males and females had equal aggression which is similar to the study by Nahida Shaban.¹³ This suggests in modern times, the pattern of aggression is same in both males and females.

Table 1: Gender wise Level of Aggression (LoA) Cross tabulation

		LoA			Total
		Low	Average	High	
Sex	Male	Count	4	25	74
		% within LoA	66.7%	40.3%	55.6%
	Female	% of Total	2.7%	16.8%	30.2%
		Count	2	37	36
Total	Female	% within LoA	33.3%	59.7%	44.4%
		% of Total	1.3%	24.8%	24.2%
	Total	Count	6	62	81
		% within LoA	100.0%	100.0%	100.0%
		% of Total	4.0%	41.6%	54.4%

Table 2: Chi-square tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.983 ^a	2	.137
Likelihood Ratio	4.012	2	.135
Linear-by-Linear Association	1.136	1	.287
N of Valid Cases	149		

Interpretation: There is no statistically significant difference in the levels of aggression among the male and female students.

Table 3: Comparing mean among male and female students for aggression scores

	Sex	N	Mean	Std. Deviation	Std. Error Mean
Aggression Score	Male	74	202.51	28.106	3.267
	Female	75	197.95	36.498	4.214

Table 4: Independent samples test

	Levene's Test for Equality of Variances	F	Sig.	t-test for Equality of Means						
				T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
HGS	Equal variances assumed	11.140	.001	15.231	148	.000	18.371	1.206	15.987	20.754
	Equal variances not assumed			15.135	118.764	.000	18.371	1.214	15.967	20.774

Interpretation: there is statistically significant difference $p = 0.001$ ($p < 0.05$)

Table 5: ANOVA

HGS	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	454.739	2	227.370	1.691	.188
Within Groups	19628.026	146	134.439		
Total	20082.765	148			

Interpretation: not significant $p = 0.188$ ($p > 0.05$)

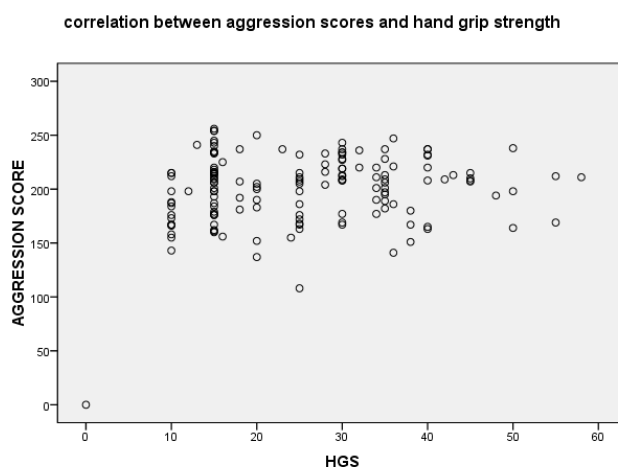
Table 6: Descriptive Statistics of aggression scores and HGS

	Mean	Std. Deviation	N
Aggression Score	200.20	32.601	149
HGS	25.27	11.794	149

Table 7: Correlation between aggression scores and HGS

		Aggression Score	HGS
Aggression Score	Pearson Correlation	1	.167*
	Sig. (2-tailed)		.041
	N	149	149
HGS	Pearson Correlation	.167*	1
	Sig. (2-tailed)	.041	
	N	149	149

*. Correlation is significant at the 0.05 level (2-tailed).

**Fig. 1:**

There was significantly higher score for physical aggression among male students than female students in the study by Smrithi et al.¹² Verbal aggression and hostility were higher in female students, while anger scores were higher in male students. However, all these scores did not show significant difference in their study. Chandra Shekar and Riffat Malik¹⁵ found that females are aggressive than males which is contradictory to the results of maximum studies. Also this study showed significant differences in working and non-working adults. Ramandeep Kaur¹⁴ study revealed that majority of the adolescents were having average (89%) level of aggression and there was significant association between family (occupation of father and order in the family) and personal factors (substance abuse) with level of aggression. No addiction to any substance, not having any physical illness, overt hostility and absence of stressor are the personal factors which contribute to aggressive behavior among adolescents. There was significant association between family (occupation of father and order in the family) and personal factors (substance abuse) with level of aggression. Self employed as well as unemployed mothers, graduation of father as well as mother, more than one sibling, and middle order in the family, normal family set

up and feeling of security by parents contribute aggressive behavior among adolescents. Also favorable environment, urban area, satisfaction from habitat and attending tuitions are the environmental factors which contribute to aggressive behavior. Other factors like unsatisfied relationship with siblings, unsatisfied relationship with peers, having three or more friends and participation in extracurricular activities are the social factors which contribute to aggressive behavior among adolescents.

Hand grip strength was significantly high in our study which is similar to most of the studies.^{10,12,16} Muscle strength is mainly determined by muscle girth especially girths of upper arm and forearm have high correlation with grip strength.¹⁷ Joshua Isen¹⁰ in his study found that the total amount of growth attained between early adolescence and young adulthood was much higher in males. There was dramatic divergence in HGS variance in males compared to females as they proceeded through adolescence. Absolute ninefold increase in HGS growth depended on genetic influences in male subjects. This pattern of development implies that testosterone is a prime determinant of male HGS. Hence male students have more muscle strength than female students. Gallup in their study, found that m

ale HGS also predicted aspects of body morphology, past aggressive behavior and sexual behavior. As HGS went up, males tended to have broader shoulders, were more aggressive and they had sex at earlier age and more sex partners.¹⁶ However in our study there was no positive correlation between hand grip strength and aggression in both males and females. Males with high HGS had socially dominant behaviors and appearance exclusively. These sex differences are related to the sexually dimorphic expression of aggression among adolescents,¹⁸ with males typically using direct, physical forms of aggression compared to females, and therefore physical strength should contribute to this effect.¹⁹ Testosterone levels in the blood may be the most contributing factor for development of HGS in males. Testosterone levels have been positively linked to both male aggression²⁰ and dominance.²¹

Some limitations of our study are that we could not measure blood testosterone levels, we could have included large study population and also this was based on questionnaire which may not reflect actual aggression and the reasons behind.

5. Conclusion

Adolescence is one of the important stressful phase of life associated with many problems including aggression. We studied the hand grip strength and aggression in first year medical students and the correlation between them. Males had higher handgrip strength compared to females whereas aggression scores were same in both males and females. There was no positive correlation between HGS and Aggression scores.

6. Source of funding

None.

7. Conflict of interest

None.

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