SHORT REPORT

Levels of physical activity and its association with antigravity muscles

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Abstract

This study was conducted to determine the association of physical activity levels with the strength of antigravity muscles in medical students of Isra University, Islamabad. An analytical cross sectional survey was conducted on 200 medical students of Isra University, Islamabad, aged between 17-25 years. The International Physical Activity Questionnaire- Short Form 7 (IPAQ-SF-7) was used to determine the physical activity levels, while Manual Muscle Testing (MMT) was used for evaluating the strength of antigravity muscles. The mean age of the study participants was 21.27±1.784. Of the 200 participants, 155 (77.5%) were females and 45 (22.5%) were males. A significant association was found between physical activity levels and the antigravity muscles' strength (p<0.001). This study concluded that physical activity levels were significantly associated with the strength of the antigravity muscles in medical students.

Keywords: Muscles, Muscle strength, Physical activity, Students.

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Introduction

Regular exercise is an essential part of a healthy lifestyle. In order to remain healthy and look credible to the patients, the medical professionals should maintain the recommended physical activity (PA) level.[1] Physical activity is defined as any bodily movement produced by skeletal muscles that results in energy expenditure[2] and can be classified into light, moderate, and vigorous PA based on its intensity.[3] According to WHO, worldwide 23% of adults aged 18 years and above and 81% of adolescents aged 11–17 years are insufficiently active. Insufficient PA contributes to 3.2 million deaths each year.[4]

By consistently engaging in activities ranging from low intensity walk to increasingly vigorous games and resistance PA, the dangers of major cardiovascular diseases (CVD) and metabolic ailments, obesity, falls, intellectual decline, osteoporosis, and muscular weakness are diminished.[5]

Some previous studies have shown that medical students are physically more active than the general population,[4] whereas other studies suggest that medical students have low PA levels because of high workload and less free time.[1] The attitude of the medical students towards health maintenance, illness prevention, and exercise is one of the predicting factors of their health condition.[4]

Physical inactivity is often associated with a decrease in the strength of antigravity muscles which badly affects the joints and increases the risk of injury.[6] Antigravity muscles help in maintaining posture, initiating movement, and keep the body upright against gravity, whether in sitting kneeling (tall kneeling or knee standing), quadruped or standing erect.[7] The body is stabilised by postural mechanism against forces which shift the centre of mass, including limb movement, thus the action of antigravity muscles is responsible for maintaining posture. Postural adjustments, needed for anticipated movements, occur because of feedforward motor commands from motor cortex and cerebellum.[8]

In normal mature movement, extensor muscles are the main antigravity muscles, including the back muscle, proximal hamstrings, and quadriceps muscles.[7] Trapezius, pectorals, latissimus dorsi, erector spinae, gluteus maximus, rectus femoris, gastrocnemius, tibialis, and soleus are also considered as antigravity muscles[9] and are more susceptible to loss of muscle mass with immobility.[6]

Though studies have been conducted in the past on antigravity muscles and PA, no study has been conducted so far to determine the association of PA levels with the strength of antigravity muscles on the medical students of Pakistan. It is essential to determine this association because PA helps in preventing decline in antigravity muscle strength, power, and endurance, and thus prevents musculoskeletal disorders. Also, weakness in antigravity muscles has been seen to not only affect mobility, but also to cause such harmful effects as falling and fractures.[10] Therefore, in order to prevent such episodes, it is imperative to determine this association. Furthermore, this study will help medical students in promoting healthy habits and in encouraging individuals to engage in regular PA by first being the role model themselves.

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Patients/Methods and Results

An analytical cross sectional survey was conducted at the Isra University, Islamabad, among the medical students from November 2018 to February 2019. After approval from the ethical committee, informed consent from the participants, and assurance concerning the confidentiality of their data, a total of 200 medical students fulfilling the eligibility criteria were recruited through non-probability convenient sampling. The sample size was calculated through Rao Soft online software,[11] with confidence interval of 95 per cent and margin of error 5 percent. The population size was 1,500[12] and resultantly the sample size calculated was 306 students, who were approached to obtain the data. However, out of these 306 students only 200 fulfilled the inclusion criteria and showed willingness to participate in the study, and thus were recruited for participation.

The medical students included were in the age range 17-25 years and belonged to Isra University, Islamabad. However, students having a previous history of diagnosed musculoskeletal disorder, fracture less than six months old, history of systemic or metabolic diseases, amputations, carcinoma or those who had any diagnosed neurological or psychiatric disorder, were excluded from the study.

The International Physical Activity Questionnaire Short Form 7(IPAQ–SF–7) was used to determine the level of PA.[3] The strength of the antigravity muscles was assessed through Manual Muscle Testing (MMT), a valid and reliable method for examining the muscle strength.[13]

A self-structured questionnaire was used to obtain the basic demographical data.

The data was analysed by using SPSS version 22. The association of PA levels with antigravity muscles' strength was analysed by Spearman's correlation test.

In the current study, 155 (77.5%) out of 200 participants were females, while 45 (22.5%) were males. The mean age of the students was 21.27±1.784 years. The mean BMI was 20.645±2.264 kg/m^2. The mean height of the participants was 5.404±0.296 feet, and the mean weight was 57.12±8.236 Kg. An inverse relation was also observed between PA and BMI as shown in Figure.

Also, 22 (11%) out of the total 200 participants, were engaged in low level of PA, 73 (36.50%) participants were involved in moderate PA, and 105 (52.50%) participants were engaged in high level of PA since one week prior to reporting their data for this research.

It was also determined that the strength of left trapezius,

Table: Association of antigravity muscles' strength with physical activity levels.

Antigravity muscles	Muscle strength	PAQ-7 Final MET-Categorical Scoring (n=200)			R	*p*-value
		Low Physical Activity	Moderate Physical Activity	High Physical Activity		
Trapezius Right	Fair	5	10	20	-0.19	0.787
	Good	8	28	39		
	Normal	9	35	46		
Trapezius Left	Fair	5	8	16	0.941	<0.001
	Good	8	34	40		
	Normal	9	31	49		
Pectorals Right	Fair	2	3	11	0.589	<0.001
	Good	9	19	33		
	Normal	11	51	61		
Pectorals Left	Fair	2	3	11	1.000	<0.001
	Good	9	19	33		
	Normal	11	51	61		
Erector Spinae Right	Fair	4	6	23	0.557	<0.001
	Good	12	39	34		
	Normal	6	28	48		
Erector Spinae Left	Fair	4	9	24	0.941	<0.001
	Good	12	35	32		
	Normal	6	29	49		
Biceps Right	Fair	2	3	13	0.502	<0.001
	Good	9	19	31		
	Normal	11	51	61		
Biceps Left	Fair	2	2	11	0.929	<0.001
	Good	9	21	31		
	Normal	11	50	63		
Lattismus Dorsi Right	Fair	4	6	23	0.530	<0.001
	Good	12	39	34		
	Normal	6	28	48		
Lattismus Dorsi Left	Fair	4	9	24	0.941	<0.001
	Good	12	35	32		
	Normal	6	29	49		
Glutues Maximus Right	Fair	3	4	7	0.483	<0.001
	Good	7	18	29		
	Normal	12	51	69		
Glutues Maximus Left	Fair	3	4	6	0.964	<0.001
	Good	7	17	28		
	Normal	12	52	71		
Quadriceps Right	Fair	3	4	7	0.664	<0.001
	Good	7	18	29		
	Normal	12	51	69		
Quadriceps Left	Fair	3	4	6	0.964	<0.001
	Good	7	17	28		
	Normal	12	52	71		
Hamstrings Right	Fair	4	9	9	0.480	<0.001
	Good	13	27	40		
	Normal	5	37	56		
Hamstrings Left	Fair	4	11	9	0.974	<0.001
	Good	13	27	39		
	Normal	5	35	57		
Tibialis Right	Fair	1	1	2	0.493	<0.001
	Good	4	15	21		
	Normal	17	57	82		
Tibialis Left	Fair	1	1	2	1.000	<0.001
	Good	4	15	21		
	Normal	17	57	82		
Gastrocnemius Right	Fair	1	1	2	0.815	<0.001
	Good	4	11	22		
	Normal	17	61	81		
Gastrocnemius Left	Fair	1	1	2	0.971	<0.001
	Good	3	11	23		
	Normal	18	61	80		
Soleus Right	Fair	1	1	2	0.815	<0.001
	Good	4	15	21		
	Normal	17	57	82		
Soleus Left	Fair	1	1	2	0.986	<0.001
	Good	4	14	21		
	Normal	17	58	82		

MET=Metabolic equivalent

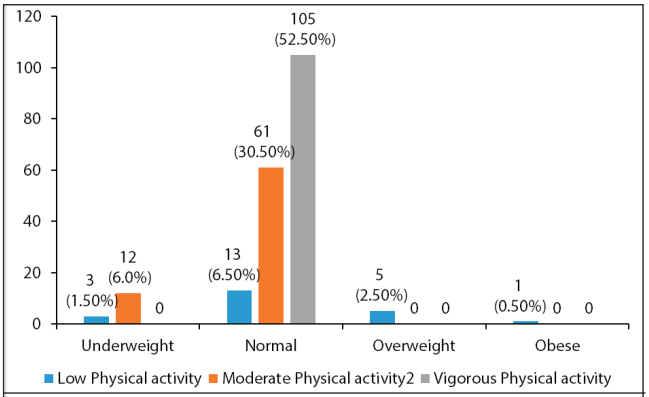

Figure: BMI of the participants and corresponding physical activity levels.

pectoralis major, erector spinae, biceps brachii, L.D, gluteus maximus, quadriceps, hamstrings, tibialis anterior, gastrocnemius, and soleus was significantly associated with the levels of PA ($p<0.001$). This is in accordance with the findings of some previous studies which concluded that the levels of PA and muscle strength are significantly related to one another, and that a lack of muscle use can lead to a decrease in the muscle strength.[14] The correlation between the PA levels and the strength of antigravity muscles is shown in Table.

Jeong UC et al. concluded in their study that low back pain, secondary lumbar segment damage, and physical disability is aggravated by disuse of or decrease in the activity of antigravity muscles for a prolonged time.[15]

Conclusion

The level of PA was significantly associated with the strength of antigravity muscles in the medical students of Isra University, Islamabad. It is suggested that the medical students should attempt to maintain adequate levels of PA as they advance towards graduation. This would be beneficial not only for their own health but it would also help them gain credibility with their patients..

The study's limitation is that the sample size was not large enough and it was conducted at a single centre; both of these limit its generalisability. Future studies should be conducted on larger sample sizes with the inclusion of participants belonging to wider geographic locations for a better understanding of the process, and for making stronger inferences about its use by medical professionals and the general public.

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